Plastic Products

December, 1933

Laminated for Furniture — Low Viscosity Lacquers on Trial — Resin Developments

DUREZ PRIMER

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- *Oil Soluble Resins:* 100% phenolic resins, odorless, soluble in common drying oils, ready for incorporation in paint and varnish formulations, giving greater durability, quick-dry and better flowing qualities to the finished product.
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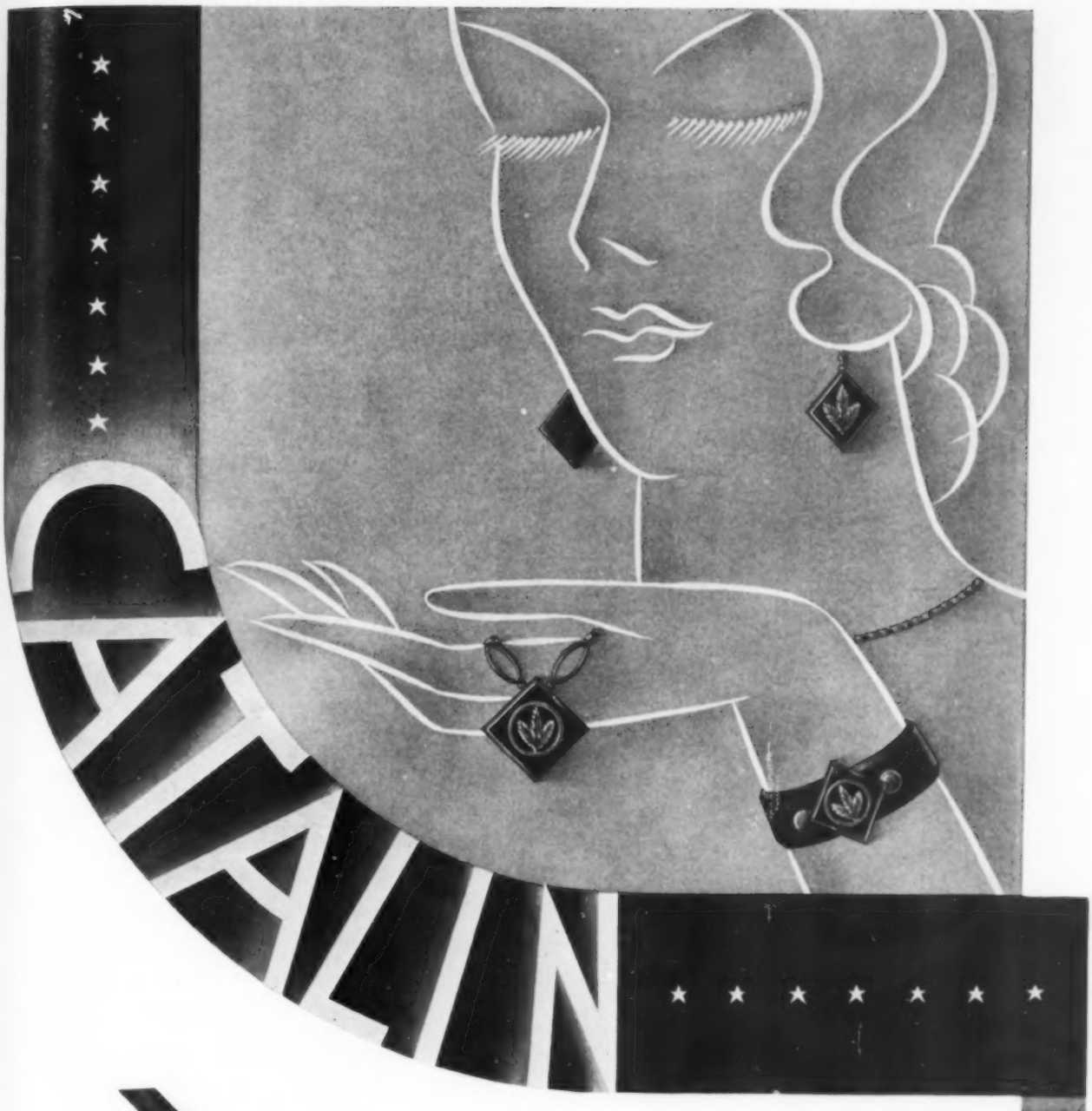
- *Colloidal Resins for Cores:* A resin-binder for sand cores in foundry work, especially for the better type of aluminum and brass casting. Reduces porosity of the metal, and being thermosetting gives excellent definition and reduces core gases.

The Ashaway Fishing-Line box, made of Durez, and one of Modern Packaging's *"All America" Twelve*



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Milady's Jewel Ensemble, illustrated above, is fashioned from jet-black Catalin, highly polished and gold ornamented.

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NRA MEMBER U.S. WE DO OUR PART

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Plastic Products

VOLUME IX NUMBER 10

Business During Inflation

INFLATION is a fact, not a theory. Our dollar values are now fixed by an unholy alliance of arbitrary theory in Washington and uncontrollable speculation abroad. They have already sunk to half the depreciation of the franc at the point at which France stabilized.

While the inflationary effects upon our business have not yet been so disturbing here as in Europe, nevertheless, we face a new and dangerous situation, and any help from recent experience in countries that have gone through this monetary turmoil will be most valuable. A trained, competent advisor in this crisis, Dr. W. S. Landis, of the American Cyanamid Company, has just returned from Europe where he made a detailed study of the effects of serious inflation upon the day by day conduct of business, and we can be of no more practical assistance than to summarize his observations and conclusions as published in this month's CHEMICAL INDUSTRIES.

Dr. Landis points out that inflation forces up the price of common shares and commodities sharply. For anyone with any wealth whatsoever tries to preserve it by buying stocks or goods. In the general skyrocketing of prices, however, raw materials, taxes, and wages lag behind somewhat. Upon the first rumors of stabilization, common stocks and commodities drop sharply, but wages continue to advance.

Inflation puts inordinate demands upon the cash available for running a business, and raises the temptation to sell securities to increase working capital. Uncanny firms fail to take full account of the time lag between the purchase of raw materials and the delivery of goods in setting their prices, while too sharp suppliers of raw materials find difficulty in making deliveries. As a result there are many bankruptcies and a new temptation, that of acquiring defunct competitors, besets the executive.

Summed up, Dr. Landis' advice is, sell for cash and keep your raw materials covered. Quote future commitments in terms of a stable foreign currency. Do not oversell common stock of a fixed par value, and above all conserve cash for the daily operation of the business.

Laminated as a Furniture Material

By C. A. Page, Micarta Engineer
Westinghouse Electric and Manufacturing Co.

Card table having metal inlaid decorative, black Micarta top inlaid with copper and orange color.

Wood, metal and stone, with ivory, mother of pearl, and precious stones as inlays were the materials used by craftsmen as early as the 15th Century preceding the Christian era. Down to the present day nothing had been found to equal wood and metal as materials of general utility for the manufacture of furniture. In modern times, however, science has made available new materials better for certain uses or applications than either wood or metal. Among such contributions to the furniture industry are the various laminated plastics.

These are dense, strong, laminated-molded materials developed especially for use as a decorative surfacing and structural material for furniture and architectural applications. They combine qualities of finish, permanency and workability found in no other type of material. Furniture manufacturers have to handle new possibilities of design and decorative effects and extra years of serviceability for their products.

In sheet form plastic laminated material is readily applied as veneer on wood, metal, and other materials. Its durability and permanency of finish make it particularly suitable on surfaces that are subjected to severe usage or require repeated cleaning such as the tops of restaurant tables, card tables, hotel dressers,

Metal office table and telephone stand having tops veneered with inlaid decorative Micarta in wood grains. Design is a panel of center-matched walnut with black banding strips and border of straight grain walnut. Office walls are wainscoted with decorative Micarta in semi-straight grain walnut. Executive office, Westinghouse Electric and Manufacturing Company.

and desks. Alcohol, fruit acids and alkalies which often injure or stain other materials will not harm it. Lighted cigarettes or cigars laid upon its surface will not burn or discolor it. Its surface will not check or peel off under any condition of service.

A large variety of attractive colors and designs are available including faithful reproductions of marble and beautiful wood grains, tapestry and conventional designs, plain colors and inlay effects in metal, wood grains, and plain colors. In sheet or plate form it is obtainable in trimmed sizes up to 48″ x 96″ and in thicknesses from 1/16″ to 1/4″ inclusive. It is furnished in both high gloss, dull and satin finishes. Angles and other molded shapes are also available.

Laminated as a Veneer

The use of laminated presents no new problems to the furniture manufacturer, its application to his products being much in line with the practices he has long followed. In plate form, over 1/8″ in thickness it may be attached to recessed furniture tops by mechanical means as it is capable of being drilled and tapped in the same manner as metal.

Used as a veneer on wood, a laminated sheet is applied under practically the same pressing conditions as are used in applying wood veneer. The assembly operations are not difficult but it is essential to pay attention to details and to select the materials used with care to insure a uniform, high quality product. The glue used should preferably be a good grade of water resistant casein glue. Animal or vegetable glues can be used also but are not recommended since they are not water resistant to any appreciable extent. The wood should have a close grain of uniform structure. Coarse, open grain has a tendency to swell during the gluing operation and distort the surface. Sugar-pine, poplar, maple, birch and mahogany provide very satisfactory gluing surfaces. Whenever possible, plywood should be used rather than solid or edge glued wood. Beside the advantages it possesses in strength and resistance to warping, it produces a better surface in the finished article. The core of the plywood used must be sound and can be either of one thickness of wood or of three or more plies. In all instances the surface to which the laminated is applied must be smooth, uniform, sound, clean, and free of paint or other finishes. The wood should have been dried or seasoned to a moisture content of less than 8 per cent.

In using decorative laminated plate as veneer it is necessary to sand the laminated surface to which the glue is to be applied in order to provide a slightly roughened surface which is essential for good adhesion. When desired, makers of these laminated plastics are furnishing their products with one surface suitably sanded.

The laminated veneering should be applied in slightly oversize dimensions to compensate for any slippage in gluing and to provide sufficient stock for the proper finishing of edges. Best adhesion is obtained where the glue is applied in a thin uniform coat to both the laminated and the wood. For large surface areas the use of a glue spreader is recommended. In preparing the glue the directions furnished by the manufacturer should be carefully followed.

The length of time the work should be kept under pressure depends largely upon the piece in question. In the veneering of edges, pressure may ordinarily be removed after a period of one to two hours. After removal from pressure, however, the work should be allowed to stand for several hours before trimming. Panel faces should be kept under pressure for a period of four to six hours.

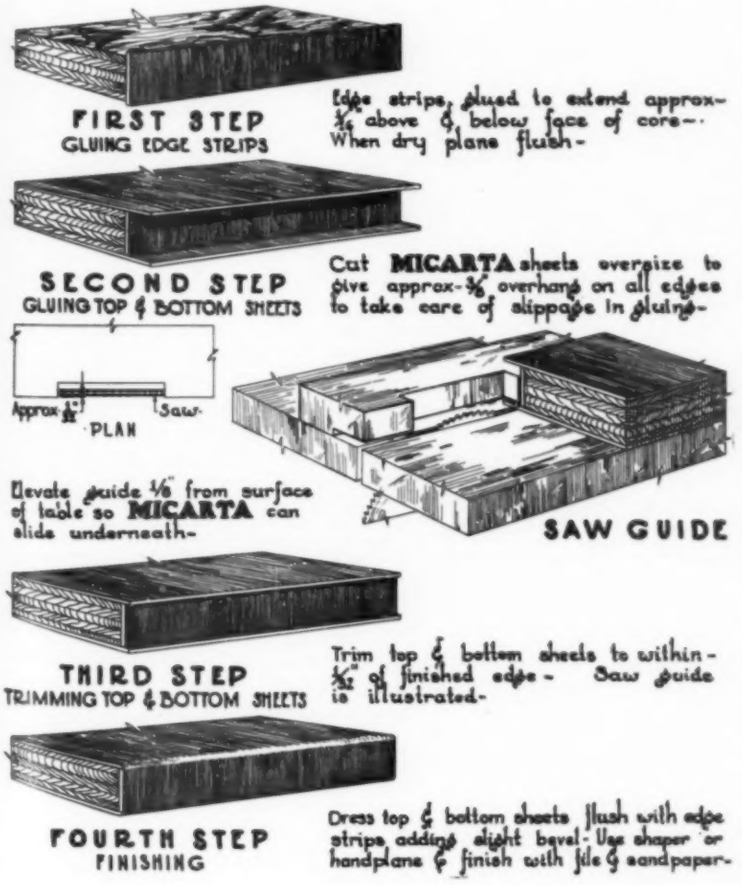
Pressing Equipment

The pressing equipment used should give a uniform pressure of 50 to 100 pounds per square inch over the entire surface area. For large panels hydraulic or toggle presses with indicating gauges are recommended. Smooth surfaced cauls or pressing plates must be used on the plastic surfaces. Panels that are to be cut into smaller sizes, after removal from the press should be seasoned or re-dried before cutting to exact sizes. These laminated resinoid sheets used on both faces of the wood produce an extremely sturdy construction and prevent warping in wide furniture members. They lend themselves nicely to the use of wood working tools of a good grade of steel. They can be sawed with a close set, fine tooth saw, and drilled with a wood drill or auger bit. Edges can be planed and shaped with hand tools or power driven machines. Plate, up to 3/32″ thickness may be rough trimmed with alligator power shears. In 1/16″ thickness it may be trimmed with a blade type hand paper trimmer.

This plastic sheet may also be applied to metal surfaces with adhesive compounds manufactured especially for use on non-porous surfaces. In veneering metal surfaces the adhesive compound should be applied to both the plastic and the metal. Ordinarily, on large surfaces a compound of this type can best be applied through the use of a spraying machine. The laminated surface should be sanded. The metal need not be roughened, but it should not have a polished surface. As in the veneering of wood, a pressure of 50 to 100 pounds per square inch of surface area is applied to the assembled work until the compound has set.

Decorative laminated is quiet and warm to the touch. Used on metal furniture tops it provides a surface equal to that of good wood furniture in friendliness and appeal. Because of its durable nature and the decorative possibilities it enlarges the field of practical applications for both wood and metal furniture.

Veneering Plywood Panels with Micarta Shop Assembly


FIRST STEP
GLUING EDGE STRIPS
Edge strips, glued to extend approx- 1/16 above & below face of core— When dry plane flush-
SECOND STEP
GLUING TOP & BOTTOM SHEETS
Cut MICARTA sheets oversize to give approx-3/8 overhang on all edges to take care of slippage in gluing-
Approx 1/8
Saw
PLAN
Elevate guide 1/8 from surface of table so MICARTA can slide underneath-
SAW GUIDE
THIRD STEP
TRIMMING TOP & BOTTOM SHEETS
Trim top & bottom sheets to within- 1/32 of finished edge - Saw guide is illustrated-
FOURTH STEP
FINISHING
Dress top & bottom sheets flush with edge strips adding slight bevel- Use shaper or handplane & finish with file & sandpaper-

Resin Developments

By George Barsky

THE metal industry evolved from the discovery of metals in nature to the smelting of ores. Then followed the development of alloys to provide specific properties. The dye industry developed to provide substitutes for more difficultly obtained coloring matters. Subsequently there were developed dyes and colors of better properties and greater variety than the natural products.

The synthetic resin industry followed the same course. The first attempts were at substitutes for natural resins. Baekeland, for example, in his early work was seeking a substitute for shellac, then selling for a dollar or more a pound. His successful development of phenolic molding compositions showed the advantage of properties such as thermoactivity found to only a slight extent, if at all, in natural resins. Today, chemists in the field of synthetic resins do not think in terms of substitutes for natural resins but in terms of properties that are desirable and the chemical means for obtaining them.

The great stimulus to the resin field is the rise of colloid chemistry and the advance in organic chemistry to the point of ability, to cope with non-crystallizable substances. In addition the organic chemist has turned more and more to the study of the effect of chemical structure on physical properties.

Today the synthetic resin industry is taking its place beside the metallurgy, the dye, the synthetic drug and the synthetic textile industries in the forefront of the march of technology. The rapid rise of this relatively new branch of applied chemistry particularly in the last five years is truly remarkable. The field is still young and the developments to come will outshine the old.

Early synthetic products were used as substitutes for natural resins in the manufacture of varnish and enamels. In the course of development there were found products of unusual and desirable properties. The modern so-called "four hour" enamels are dependent upon synthetic products. Today synthetic resins have made possible the manufacture of coatings of unusual gloss and durability. Recently a very large automobile manufacturer announced that all his cars were being finished with synthetic resin coatings. Even during the present lull in business activity plants making some of the newer types of synthetic resins have been pressed to fill their orders.

It is in the field of molded products that the public has become acquainted with synthetic resins. Resins of this character lend themselves so readily to the mass production of standard shapes that we continually come across them in all types of articles. The development of the molding operation as an accurate and rapid method of fabrication has been a real contribution. Multicavity molds have resulted in low cost production of relatively complex shapes with no machining, low labor costs and economy of material. The pieces formed have, except for the flash edges, well finished surfaces requiring little if any polishing. There is no question of their utility as well as their beauty.

The introduction of new resins of light base color, capable of being colored in any shade, has tremendously increased the possibilities. The conventional black and brown of Bakelite was always a handicap in those places where color is desirable. The imitation of natural materials such as wood and stone is natural, but the growth away to new and hitherto unknown effort is beginning.

The term resin is characteristic of a physical state rather than of a particular chemical composition, although of course, chemical composition does have an effect on physical as well as on chemical properties. A convenient definition of resins is that given by Professor Haber:

"Resins are mixtures of organic substances having the character of supercooled melts, which maintain their more or less definite vitreous character for the reason that their exceptionally low orientation velocity is unable to be exercised."

While it is not possible to give certain characteristics as common to all type of resins the following is generally applicable:

1. Vitreous texture.
2. Organic composition (chars when heated to high temperatures).
3. Properties characteristic of a mixture of mutually soluble constituents of high molecular weight.

The following characteristics apply to some resins but not to all:

4. Solubility in suitable solvents.
5. Capable of forming film on evaporation of the solvent.

Synthetic resins are those produced by reaction of non-resinous compounds. For example, phenol and formaldehyde react to give the well-known Bakelite type resins: urea and formaldehyde give the urea resins: glycerol and phthalic anhydride give alkyd resins.

To the chemist, the characteristic of a mixture of mutually soluble constituents of high molecular weight is perhaps the most significant. Ordinarily substances of high molecular weight are crystalline solids. The admixture of soluble constituents to such a substance results in a lowering of the melting point. Thus a mixture of several such substances would give what is really a liquid but resembles a solid in appearance. It is really a supercooled liquid.

In the synthesis of resins, therefore, reactions are employed which result in the formation of compounds of high molecular weight. These are of two classes:

1. Condensation.
2. Polymerization.

Condensation is the union of the two molecules with the elimination of water or its equivalent. Examples of this are the reaction of urea and methylene glycol (formaldehyde in solution). This can proceed to the building up of a series of high molecular weight compounds of similar structure and mutual solubility.

Polymerization is the formation of higher molecular weight compounds by the interaction of two or more molecules of the same or similar compounds. For example, we may cite the polymerization of styrene.

Both reactions may be involved in the formation of any particular resin. Thus according to recent theories, in the manufacture of Bakelite a compound known as 2.2 phenoxy-hydroxyphenyl ethylene is formed by condensation. Subsequently this polymerizes to the final stage of the cured resin.

The type of linkages cited may also be complicated by cross linkages from chain to chain or across individual changes giving three dimensional structures.

There are various classifications of synthetic resins. For example, we have the very convenient division into (a) thermoplastic; (b) heat hardening or thermoactive; (c) oxygen hardening.

The thermoplastic resins soften or melt with heat and become more rigid when cool. This cycle can be repeated almost indefinitely.

The thermoactive resins under the influence of heat not only soften but also undergo a chemical change resulting in the loss of

softening-with-temperature ability. In the manufacture of these resins there occurs an intermediate stage at which the course of the reactions taking place may be interrupted and some residual reactive reserved for final hardening.

Heat hardening resins may be used for: (a) casting; (b) molding; (c) laminating. In the manufacture of castings the reactions between the ingredients are carried as far as possible with the mass still fluid when hot. The liquid or pasty resin with or without fillers and coloring matter is then poured into molds. These are then placed in ovens to cure. There the final reactions take place resulting in the infusible, insoluble product. This may take several days. Often standard forms are used and the product furnished in the shape of rod, bar, cylinders, plates, etc. These can be subsequently cut by machine tools. Examples of these resins are some of the alkyd resins, such as the unmodified glycerol phthalate, and certain phenolic resins. Clear and transparent products may be obtained and pieces required only in small quantities can be made by this method as the high cost of steel molds, such as are required for heat and pressure molding, is eliminated.

Another thermoactive resin application is in heat and pressure molding. In this operation the resin, usually mixed with an inert filling material, is subjected to heat and pressure in steel molds. Under these conditions, a chemical change takes place. The resin softens due to the temperature. The effect of the pressure is to cause it to flow and fill out the mold space. At the same time chemical change is taking place resulting in the conversion of the flowing resin into a hard, infusible product which when finally removed from the mold is, though still hot, rigid and reproduces exactly the shape of the mold. Examples of this type are the phenolics and the urea molding resins.

Inert fillers, such as wood flour, asbestos, paper pulp, are practically always used in molding composition. These reduce the cost and in addition improve the shock resistance of the molded article.

The molding material is supplied in the form of powder, granules, or sheets. Instead of weighing out the charges for each mold, preforming is resorted to. In this operation powder or granules are tabulated in automatic presses and a fixed number of pills used per charge. Metal parts may be set in the mold and the resin molded around these parts. Molds are usually multicavity, that is, several pieces are made in one operation. Hardened steel and often alloy steels are used for the molds. Heating is accomplished by means of steam. Temperatures from 250° F. to 320° F. are used; pressures are from 1,500 to 4,000 lbs. per square inch. These are usually obtained hydraulically.

Laminating

Laminating is really a form of molding. Paper or cloth is impregnated with resin; usually by passing it through a bath of resins dissolved in a solvent. The solvent is then evaporated and the sheet cut to size, stacked in bundles of several sheets. These are then placed in hydraulic presses between steam-heated metal plates and cured under heat and pressure. Standard sheets as large as 36 in. x 110 in. and ranging in thickness from 1/64 in. up to 2 in. are produced commercially. Sheets can be cut and punched. Shapes with some variation from flat sheets can be produced by this method, for example, serving trays such as are common in cafeterias and in households. Decorative effects can be produced by using special surface sheets. For example, paper printed to simulate wood is often employed. Tubes, rods, and cable conduit also can be made from the impregnated sheets.

By using cloth, such as canvas, and alternating the warp and woof in the layers, a material of much greater shock resistance may be obtained. Such material is used in gears of various kinds. Cutting from blanks may be done by the ordinary gear cutting machines such as are used for metal gears. Advantages over metal are lightness and silent operation.

The oxygen convertible resins require the presence of oxygen for the final chemical transformation. In these cases the effect is similar to that of the drying of a linseed oil film. The oil takes up oxygen from the air and is thus converted to a solid substance or mixture of substances. Examples of this type are the oxygen hardening alkyd resins made from a mixture of glycerol, phthalic anhydride and an oxygen absorbing organic acid. The oxygen absorption may take place at ordinary temperatures or at elevated temperatures, i. e., a baking. Owing to the requirement of oxygen contact for hardening, such resins are used mostly in film coatings such as varnishes and enamels.

Cast Phenolic Resins

The phenolic resins as we know them today originated with the work of Dr. Baekeland. They are extensively used and have properties which cannot be duplicated by natural resins. They have high water and oil resistance and relatively high temperature resistance. Their dielectric properties are excellent. They are quite permanent and the molded articles do not shrink or deform otherwise with age. Phenolic molding resins are made by the reaction of phenol with formaldehyde. This reaction is catalyzed by both acids and bases. Under ordinary conditions acid catalysts give the so-called Novolak resins which do not, unless further treated, give insoluble and infusible resins. With alkali only the hardening type can be prepared unless a large excess of phenol is present. The first step of the reaction seems to be the formation of oxybenzyl alcohols. Acid seems to cause further reaction to dihydroxydiphenyl methane, while alkali tends to form hydroxyphenylphenoxymethane. This compound reacts further with formaldehyde to give 2.2 hydroxy phenylphenoxy ethylene. It is this last compound, or series of compounds, since various isomers can be formed, that polymerizes in the heat and pressure molding operation to give the final insoluble and infusible product. In commercial operation phenol and formaldehyde are condensed and, water is removed, often by vacuum evaporation. The resulting resin brought to the proper viscosity, cast, and allowed to cool. It is subsequently mixed with filler and with hexamethylenetetramine which acts as an accelerator in the final curing operation.

For the preparation of laminating varnishes, the resin is dissolved in solvents, usually alcohol. Impregnation of the paper or fabric is accomplished by means of special machines. The fabric passes continually through a dip tank and through a tower where the solvent is evaporated. The solvent can be recovered by the usual solvent recovery apparatus.

Original phenolic resins made as described above can also be cast as previously discussed. Cast resins of very light color and excellent machining qualities are made by a variation of the process employed for molding resins. The improvement in color and physical properties has been accomplished by change in the ratio of reactants and by the use of precautions to prevent formation of colored by-products. In making these products phenol and formaldehyde are reacted in the presence of small quantities of alkaline catalysts. The resulting mixture is then very carefully evaporated to remove as much water as possible. This is accomplished by use of a vacuum which also serves to keep the temperature down and by the addition of other substances such as glycerine which impart plasticity to the mass and enables the evaporation to be carried out sufficiently. If too much water is left in the final product the final castings are apt to be opaque. The operation is usually carried out with relatively small batches. Large batches offer difficulties probably because of slower evaporation and thickening too far before all the water has been evaporated. Dyes and other materials for special effects are added before the pouring operation.

There are two general types of phenolic varnish resins. One consists almost entirely of phenolic resin; the other is modified phenolic resin containing an appreciable proportion of other ingredients. The first type is usually made of special phenols such as parahydroxydiphenyl. The second type is made by heating the intermediate phenolic condensation product with excess of rosin. In this operation the phenolic resin cures in dis-

persed form in the rosin. It may be also that there is some combination between the abietic acid (the chief constituent of rosin) and the intermediate phenolic resin. The resulting mixture is esterified by means of glycerol which changes the excess of abietic acid to the glyceride.

These phenolic varnish resins are soluble in varnish oils such as tung oil. By treatment of such oils with these resins in a varnish kettle, quick drying varnishes and enamels may be made. The synthetic resins accomplish two things; their presence of itself promotes the quick drying. In addition during the cooking operation where the oils are polymerized to give a satisfactory finish, the resins retard the gellation of the oils and so facilitate the manufacture of varnishes.

Alkyd Resins

Alkyd resins are those made from polyhydric alcohols and polybasic acids. A very large variety of such resins are possible owing to the large variety of polyhydric alcohols and polybasic acids available. In addition modifying agents are used and those of course increase the variety possible. One example of unmodified resins is the ethylene glycol phthalic anhydride product which is non-hardening and of balsam-like appearance. This non-hardening characteristic is probably due to the fact that only the long chain products can be formed. With glycerol, however, the presence of the three hydroxy groups in glycerol makes other structures possible. Thus it is possible to prepare glycerol phthalate resin which on prolonged heating becomes insoluble and infusible. This is probably due to the linking of chains one to the other and to the cross linking in the same chains. These resins have been used for the formation of plastic masses of light color and transparency. This resin is not molded by the ordinary method because it has a very slow rate of cure. It must be cured in an oven with a very slow rising temperature in such a way that the volatile products can escape. Insoluble, infusible glycerol phthalate resins may be plasticized by the addition of substances such as succinic acid and diethylene glycol to the reaction mass. In this case we have chains of the soft resin molecules attached to the hard resin molecules, resulting in a more flexible product. It also probably is true that a larger number of compounds are formed and this may have some effect on the plasticity. By variation of the proportions the flexibility may be changed.

Another method of modifying the heat convertible glycerol phthalate resin is by the addition of a monobasic acid. This may be perhaps most clearly visualized by considering the monoglyceride. As would be expected the monoglyceride would behave in the same fashion as a dihydric alcohol, that is, one of the hydroxy groups is esterified and blocked and the resulting product has only two available groups for reaction and should therefore give products similar to those obtained with ethylene glycol. The properties obtained depend, of course, upon the nature of the modifying agent used and the amount.

The non-hardening resins are used in the formulation of nitrocellulose lacquers and for other purposes, such as the impregnation of paper to produce parchment effects. Their particular value in nitrocellulose lacquer formulation is the great durability they impart to the film. This is due to their opacity to ultraviolet light, which has a deleterious effect on nitrocellulose.

Unsaturated acids such as acids of linseed or tung oil may be used to modify glycerol phthalate resins. In these cases the resulting product is an oxygen hardening resin, the action of the oxygen of the air probably causing cross linkages to give compounds of much higher molecular weight. These products are extensively used for quick drying varnishes and enamels and for finishes on automobiles. They may be used alone or in admixture with drying oils. They have unusual durability on exposure to the weather and in addition excellent adhesion and retention of elasticity with age. The discoloration is relatively slight.

The proportion of modifying agent governs the solubility. The higher the proportion, the greater the petroleum tolerance and the miscibility with oils. The lower the proportion of modifying agent, the shorter the drying time and the greater the durability. One way of looking at these products is as an oxidizing oil in which some of the acid group are removed and substituted by phthalic acid which serves to link up several molecules to a product of higher molecular weight.

In the manufacture of these materials the ingredients are mixed and heated to a relatively high temperature to drive off the water and promote the reaction of the condensation. The cooking must be done under carefully controlled conditions to insure that all batches are carried to the same stage, that is, to insure uniformity. Water resistance of the resin has in many cases not been as great as desired. But this has been greatly improved.

In the formation of urea resins, urea and formaldehyde are reacted in the presence of an alkaline catalyst. The resulting solution is mixed with a high grade cellulose filler, dried under carefully controlled conditions. The dried product is ground with pigments and accelerator and comes on the market in the form of powder.

For certain molding operations it is more desirable to have a denser material rather than the fluffy powder. Densification is accomplished by means of preforming and chopping the tablets to form granules or by means of densifying and agglomerating machinery.

For laminating, water solutions are used. These are of several grades of different concentrations. Urea alone is used or mixtures of urea with thiourea. The thiourea mixtures give more water resistant products but are more expensive and cause stain of the ordinary mold steels.

The resin itself is colorless and because of the white filler used very light shades are obtainable. With the light colors small amounts of dirt in the molding powder show up readily in the finished piece and the utmost precautions are necessary to avoid contamination, both in manufacturing the powder and in molding, to reduce the proportion of rejected pieces. In addition, due to the translucency of the finished moldings slight defects in molding are easily noticed. Molding temperatures are slightly lower than with the phenolics. The cured resin does not burn on exposure to free flames but chars and emits disagreeable odors.

Water white transparent cast products can be made but they do not stand up. Checking and cracking occurs due to atmospheric conditions. Although there have been some attempts at producing products for use in coatings, this application has not yet amounted to very much commercially.

Vinyl Resins

These are formed by the polymerization of vinyl compounds, $-CH=CH_2$ produced from acetylene. This polymerization is catalyzed by oxidizing reagents, also by light and heat. The resins vary from rubbery to brittle products. Colorless and odorless vinyl resins can be prepared. They are thermoplastic and not thermoreactive. Hence they may be hot molded but must be chilled in the mold before removal to avoid distortion. Plates can be made by sheeting on rolls or by hot pressing. Tubes and rods are produced by extrusion. The products are tough and resilient. One recent application is in the manufacture of the new long playing phonograph records. Lacquers can be made by dissolving the resin in suitable solvents. Laminating of special sheets impregnated with vinyl resins and backing of other materials is also possible.

The formation of resinous products in petroleum distillates has been known for some time and much work has been done to prevent this gum formation which is objectionable in gasoline. Recently attention has been turned to these reactions to see if useful products could be obtained. The problem briefly is to conduct the refinery operations so as to obtain high yields of the desirable reactants and then to guide the reactions of these substances to produce resins of the required properties. This is a field for research that should prove fruitful.

Self Tapping Screws

Speedier Assemblies

Stronger Fastenings

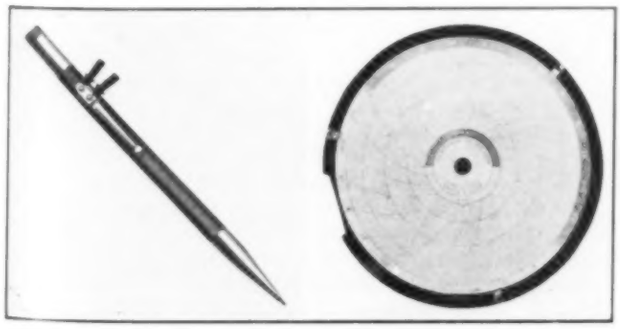
Lower Molding Cost

Francis A. Westbrook, M. E.

SELF-TAPPING screws used in assembling plastic products, varying from outboard motor parts to ornaments for women's shoes, result in marked advantages from the standpoint of improved quality of product and make possible simplifications which speed up production in molding and assembling, as well as in other operations. The best way to indicate what may be done is to discuss a few specific instances in widely varying products; but before discussing actual applications it may be just as well to give a few words of explanation of what hardened self-tapping screws are and the general principles under which they are applicable.

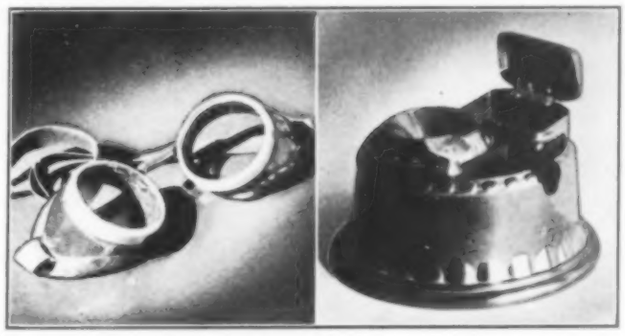
Briefly there are two types of hardened self-tapping screws in general use in the plastic trades. They are known as the type "Z" hardened self-tapping sheet metal screw and the type "U" hardened metallic drive screw. The type "Z" screws are turned in with a screw driver into holes that are drilled or molded in the material. Their hardened thread forms a corresponding thread in the material as it is turned in, thus eliminating the necessity of tapping. When necessary this type of screw can be removed and replaced again without impairing the security of the assembly. The type "U" screws are intended for making permanent fastenings only. They are driven in with a hammer or otherwise forced into holes drilled or molded in the parts. As they cannot be readily removed they are therefore recommended only for assembling parts that do not have to be disassembled for servicing or repairs.

Tests made at the College of Engineering, New York University, show that these screws have a greater holding power under tensional stresses than machine screws in tapped holes in plastic parts and comparable holding power to machine screws used in brass bushings cast in the material, a decided advantage when the cost of the brass bushing and the time factor is considered.



Clip of autopoint pencil fastened with Type "U" Hardened Metallic Drive Screws. Chart of Raranex Recorder held in position by clips fastened with Type "Z" Hardened Self-tapping Screws.

These tests were made with standard laboratory test discs 4" in diameter and ⅛" thick. In five of these discs there were molded three each of the threaded bushings for five sizes of machine screws. Five other specimens were provided with blank holes for the hardened self-tapping screws. The comparative tests indicated that in every case, except a few where the material



Ventilation screen of industrial goggles fastened to plastic frame with Type "U" Hardened Metallic Drive Screws. Bottom plate and hinges of Bakelite ash tray attached with same type screws.

failed, the holding power of the self-tapping screws exceeded that of the machine screws in bushings.

The advantages of these screws may be briefly enumerated as follows: One perplexing problem confronting molders and assemblers of plastic products is a satisfactory and economical means of joining parts or making fastenings to parts. At present when two parts of such materials are to be joined, the practice of most molders is to cast a threaded bushing or insert in one part and then use a machine screw for assembling the two. This procedure is objectionable for a number of reasons, the most pertinent of which are:

1. The bushing is expensive—frequently the most costly item of the product.
2. The time required to insert the bushing in the mold slows up production and where a multiple cavity mold is used an extra workman may be required.
3. At best the bushing, or insert, is a mechanical compromise because it is not an integral part of the unit and consequently, its use frequently weakens the strength of the assembly and adds unnecessary weight.
4. To obtain greater security inserts and bushings are often made over-size in order to provide a larger circumferential area, thus adding to the cost and awkwardness of the job.

Alternative to machine screws with threaded inserts the practice is sometimes followed of casting or drilling a hole in the

parts and then tapping them for use with machine screws. This is not satisfactory either because of the following disadvantages:

1. Due to the inherent nature of the plastic material the tapped threads are weak. They are easily marred and the reinsertion of the screws quickly breaks them down.
2. There is a large loss due to the breakage of the taps resulting in an important item of expense which is usually overlooked when figuring costs.

Molders and assemblers of plastic products have resorted to many expedients to overcome the disadvantages of molded inserts or tapped holes. Among these are assembling with the use of eyelets or grommets, casting a hollow rivet in one part and after assembly spinning or peening over the free end, or using a

Typical assemblies made with Type "U" and Type "Z" Hardened Self-tapping Screws

through rivet and peening over the projecting end. While all of these methods more or less serve the purpose for which they are intended, none has proven entirely satisfactory, because of the structural and assembling difficulties just pointed out. The spinning operations require tooling up expense; peening over rivets is largely responsible for an unusual amount of breakage and scrapped parts; and the strength of the assemblies thus made is always subject to question.

Self-tapping screws seem to answer these problems in a satisfactory manner in practically all instances in which they have been tried. Several examples taken from products which are very different from each other will give a good idea of the experience of a number of manufacturers in the field of plastics.

For instance, Schneider Brothers, make, among other things, molded smoking sets. The old method of fastening together the parts was by means of inserts and machine screws. They tried hardened drive screws and found that they could, by this means, improve the appearance of their product and hold the parts in place more securely. In addition, by eliminating the inserts they speed up production in the molding department over 30% and in the assembling department over 100%. A further interesting consideration is that in this case the inserts cost more than the drive screws. The importance of savings like this can hardly be over-estimated, especially at a time when labor and commodity costs are going up and it is extremely necessary to keep the retail price of manufactured products down.

In the instance given above the application of the self-tapping screws was for fastening hinges and base retaining springs to an ash tray of phenolic material, the only really fussy mechanical detail in the whole product. A second example in the use of these screws in an entirely different field is the experience of the Triplex Products Corporation in attaching terminal station blocks to a molded block in its electric time switch. In this case holes in the phenolic molded part were formerly tapped and machine screws were used. By resorting to self-tapping screws and giving up tapping the holes it was found that the assembly could be made in a fraction of the time formerly required and the holding power of the drive screws is much greater than that of the machine screws.

The Real Equity Co. has adopted the self-tapping screws to replace escutcheon pins in the assembly of radio accessories. The operation consists of fastening a molded base to the molded cup of a radio condenser, the base being inserted into the cup and held in place by four of the self-tapping screws through the wall of the cup and the flange of the base. When they used escutcheon pins it was necessary to stone down a drill to fit the pin and when the drill became worn a bit the hole would be too small so that the pins would fit so tightly that they would split the part. With self-tapping screws it is possible to use a standard drill and extreme accuracy in the size of the hole was not necessary to avoid breakage. It was also found that the screws hold much better than escutcheon pins.

An excellent example of reduced costs is that of the Autopoint Pencil Company which has used metallic drive screws for attaching the pocket clip of the molded barrel of a pencil. This clip was formerly attached by means of a hexagonal headed machine screw. This has been replaced with two drive screws ⅛" long. A saving of $1.26 per thousand assembled pencils has been realized by this substitution.

These screws may be used with equally satisfactory results in attaching metal parts to plastic parts. For instance, the Permutit Company has made some important savings in this way by fastening the three metal chart clips to the thin Bakelite molded cover of its Ranarex Recorder. Half of the former labor cost has been saved by eliminating the tapping operating and shortening the production route.

A great many other products are being assembled in the same way. To mention only a few, these include industrial goggles in which the metal screen is fastened to the molded frame, the assembly of women's dress and shoe ornaments made of pyroxylin, acetate and casein products, etc., door handles made of cast phenolics, parts of a steam heater for a permanent hair waving device made of phenolic resinoids.

Uneven Evaporation Quick-Drying Varnishes

Although marked reduction in drying time by comparison with the older type of linseed oil varnishes is exhibited by some of the modern synthetic resin wood oil products, this advantage has hitherto been largely discounted by the rapidity with which skinning occurs in the partially-filled containers. This is particularly undesirable in pigmented products, where the finish is liable to be utterly ruined by pigmented specks of gelled material.

The problem has been attacked both with the aid of special solvents and negative catalytic agents. A good example of the former is dipentene, which prevents skin formation of a cooked wood-oil resin varnish even after exposure in an open container for 60 days. In these experiments the solvent actually consisted of a 75:25 mixture of dipentene and white spirit. The second class cites substances of the polyhydroxy phenol class as being most effective. Pyrocatechol, for instance, when added in the proportion of one per cent. (calculated upon the oil content) to the varnish which had been thinned with white spirit only, retarded skin formation for 18 days. Its use is very much limited, however, by the fact that it slows down drying when added in a greater proportion than 0.1 per cent. of the oil content.

Further advancement lies in an anti-oxidizing preparation, the use of which is not attended by the fundamental drawback of pure pyrocatechol, that can be extracted from pine wood. It is composed of a mixture of guaiacol, pyrocatechol, pyrogallol and their derivatives, and is being sold at a relatively low price. Both skinning and gelling are said to be minimized by stirring the preparation (in the proportion of ⅛ to ½ oz. per gallon of varnish) into the finished varnish after it has cooled to room temperature.

So far-reaching a case as the du Pont-Glidden lacquer patents suit deserves to be understood thoroughly and the able arguments of the attorneys (abstracted here) bring forth facts and conclusions that are as important as they are interesting.

Lacquer Viscosity on Trial

Brief of (Glidden) Defendant-Appellee

THE principal issues involved and in dispute are invention and direct anticipation. The District Court concluded that all the claims of the patent are invalid for (1) lack of invention, and (2) because of anticipation by the disclosures of the Groves & Ward British patent, 128,659 of 1919, the Carlsson & Thall U. S. patent, 1,375,208, and the prior knowledge and use of nitrocellulose lacquers of the kind disclosed by Flaherty on the part of Gilbert C. Bacon and William F. Doerflinger. On both issues this Court reached a different conclusion. The opinion of this Court, however, did not discuss claims 12 and 17 specifically, nor did it touch upon the anticipatory effect of the disclosures in the Groves & Ward and Carlsson & Thall patents.

Argument

1—The Prior Workers in the Art Had Not Failed to Make Useful Lacquer from Nitrocellulose Whose Viscosity Characteristic Was Below Flaherty's Limit. It Was Not in the Nitrocellulose Base But in the Compounding Ingredients That Bacon's Adamantine X Differed From Flaherty's Viscolac.

The District Court found as a fact that nitrocellulose lacquer solutions in which the nitrocellulose base used had a viscosity lower than 4.6 seconds Hercules had been made and used by Gilbert C. Bacon at least as early as July 20, 1919, and by William F. Doerflinger at least as early as 1913, and continuously from 1913 to 1919, the viscosity characteristic of the nitrocellulose used in Doerflinger's solution being approximately ½ seconds Hercules. Since Flaherty was later, acceptance of these findings, or either of them, requires the conclusion that the patent is invalid because anticipated. . . .

It is of the essence of this Court's opinion rejecting the above findings of the District Court, and the evidence upon which they are based, that Flaherty's Viscolac was a lacquer employing as a base nitrocellulose having a viscosity characteristic below 4.6 seconds Hercules; that Doerflinger's product was not "a lacquer such as Viscolac"; and that "whatever Bacon got, it was not Viscolac."

With the expressed apprehension that there may be some illusion in its weighing of the facts, this Court comes to that conclusion because it could find in the record nothing "except the knowledge that the viscosity must be kept below Flaherty's limit" to "determine the success of the new product". Great weight is attributed to what the Court believed to be a copying by the art of *the low viscosity nitrocellulose base* of Viscolac after that product appeared on the market and "success of the new product" is thought of as the projection of the use of nitrocellulose lacquers into the automobile and furniture fields, upon which plaintiff in their brief place so much stress.

From these considerations the Court deduces that the other workers in the field had failed to make a lacquer within the range of *low viscosity nitrocellulose* that Viscolac contained. But the evidence refutes this.

The record shows just when the Atlas-Zapon Company put out a commercial product to match Viscolac, and that to accomplish this it changed its former product *not in respect to the nitrocellulose base* but only in respect to matters of compounding, with which the Flaherty patent concededly has nothing to do. . . .

2—It Was Not Viscolac That Replaced Automobile Body Paints and Wood Varnishes, and Those Commercial Applications Cannot, as a Matter of Fact, Be Invoked to Establish Invention in Flaherty's Disclosure Over the Prior General Knowledge of the Relation of Viscosity-Characteristic to Covering Power and the Prior Particular Knowledge of Nitrocellulose Lacquers (of More Limited Commercial Application) Containing Nitrocellulose Having a Viscosity-Characteristic Below 4.6 Seconds.

In the light of this fact that it was not a change in the low viscosity nitrocellulose base, but only a change of compounding ingredients, that was made by the Atlas-Zapon Company in the summer of 1922 to match the du Pont Company's then marketed Viscolac, we most earnestly ask this Court to re-weigh the significance of the projection of the use of nitrocellulose lacquers into the automobile and furniture fields.

It is certainly true that these particular enlargements of the nitrocellulose covering composition industry depend upon the use of low viscosity nitrocellulose. *It is equally clear that they depend also upon proper compounding with other ingredients.* . . .

The truth is that Flaherty's Viscolac—the product described in his patent—did not pre-empt those fields. And that fact is not disposed of by pointing merely to the circumstance that those new automobile body paints and wood varnishes are made from nitrocellulose within the range disclosed in Flaherty's patent. Until a further fact structure has been built upon that mere circumstance, there is nothing to indicate whether (1) these particular commercial developments are due to the low viscosity alone, and Carlsson & Thall, Bacon and Doerflinger did not have viscosities below that limit because they did not capture those commercial fields; or (2) Carlsson & Thall, Bacon and Doerflinger possessed knowledge of nitrocellulose lacquers within that range, but this range alone was not enough to pre-empt the new fields. . . .

When the bill of complaint in this case was filed, it was plaintiff's position that this projection of nitrocellulose lacquers into new fields "such, for instance, as automobiles or furniture," was due to "the inventions of said reissue Letters Patent No. 16,803 *and said* (Hitt) *Letters Patent No. 1,710,453*".

The record shows that position to be historically correct at least from the point of view of the actual introduction of low viscosity nitrocellulose lacquers into the automobile body-finishing field by the conjoint work of the du Pont Company and its close associate, General Motors.

During the prosecution of the Hitt application, the du Pont Company asserted that "The Examiner hardly needs to be reminded that the working out of the specific formula and the specific ingredients and proportions for a practical low viscosity lacquer such as automobile Duco (which is herein being specifically claimed) required intensive research and many, many trials before final success was reached, and this kind of advance in the art can hardly be termed obvious."

And, after pointing out that the production of du Pont Duco involved a certain sacrifice of lustre, incident to Hitt's chosen admixture of "pigment, resin, and solvent softener," said: "The

result of this compromise was the hard, durable, tough, and successful film known today as Duco."

To emphasize this, the du Pont Company added to the specification of the Hitt patent the words: "In this manner, the original low viscosity nitrocellulose is made available for all forms of lacquers and enamels where flexibility is required, whereas previously such low viscosity solutions had a more limited use even with the presence of a softener like castor oil."

The expression "had a more limited use, even with the presence of a softener like castor oil" has reference to the Viscolac of Flaherty's patent. . . .

We are not suggesting that this Duco base was not below the 4.6 second limit defined in the Flaherty claims. The point we are making is of the historical fact that lacquer made according to, or within, the examples of the Flaherty patent is not Duco; that the projection of low viscosity nitrocellulose lacquers into these new fields definitely required something in addition to mere reduction in viscosity; and was not the same thing as Flaherty's Viscolac. . . .

3—The Work, Knowledge and Prior Disclosure and Use of Carlsson & Thall, of Bacon and of Doerflinger Is Direct Anticipation.

The Carlsson & Thall patent owned by Atlas-Zapon Company and found by the District Court to be a direct anticipation is not mentioned in this Court's opinion. Plaintiff's contention is that the specific example stated in this patent would produce a nitrocellulose too far reduced to make a good lacquer. Plaintiff relies on the contention that this specification disclosed no more than was known to Bacon, and that Bacon failed to make a useful low viscosity nitrocellulose lacquer. The whole argument is coupled with the assertion that Flaherty disclosed and claimed a lower limit of viscosity reduction; a contention which this Court rejects.

The disclosure of the Carlsson & Thall patent was in substance the same as the disclosure of Bacon's application with which it was in interference. Bacon's application was filed on June 25, 1919. In it, Bacon said: "The present invention, as before stated, resides in the provision of a process of making highly concentrated solutions of nitrocellulose, useful, among other things as a varnish or lacquer. Hitherto it has not been possible to make a solution containing more than 10 ounces of nitrocotton to a gallon of solvent which had sufficient mobility for satisfactory use as a varnish or lacquer. My invention presents improved means of making solutions containing even as high as 100 ounces to the gallon of solvent, which, in spite of their high concentration, have sufficient fluidity to be used with a brush or a spraying machine."

This is certainly the disclosure of means to produce, for lacquer purposes, nitrocellulose reduced to any degree between the upper limit and the lower limit mentioned.

Plaintiff does not contend that the lower limit disclosed by Bacon—100 ounce solution—is not below Flaherty's 4.6 seconds. Its contention is that Bacon's 100 ounce concentration is too low to make a good lacquer and is below Flaherty's supposed lower limit.

4—Bacon Was Ahead of Flaherty at Every Step on the Closely Parallel Paths They Followed.

The District Court held that Bacon's work was an anticipation of Flaherty. This Court reversed that holding. It disposed of Bacon's July, 1919, wood lacquer by reference to the August, 1920, interim report on the development of a compound "for finishing woodwork as a substitute for varnish" a highly developed compound very different from Bacon's simple nitrocellulose lacquer of July, 1919, as it is different from the product referred to in Flaherty's patent as issued when he says: "The new pyroxylin solutions of high pyroxylin content may be used directly as lacquers with advantage." The August report does not, as this Court supposed, show that the July product was not a suitable lacquer for all purposes where simple nitrocellulose solutions containing no gums "may be used to advantage". It shows only that the July, 1918, lacquer had not been refined by compounding to the point where it became a wood varnish substitute.

Proceeding to Bacon's later work, the Court finds that the Adamantine XX lacquer was of a viscosity characteristic too low to be an anticipation. Of Adamantine X the Court says, "it was probably not satisfactory; there is testimony that it checked and cracked. In any event it appeared in January, 1921, and after Flaherty had developed his own lacquer. Indeed, Flaherty's first sale was in January, 1921, following some trial deliveries in December."

We think it can be demonstrated that this holding that Flaherty antedated Bacon is wrong. It involves the assumption, which the record refutes, that Flaherty's earliest product was the Viscolac of his patent examples. The fact is that Flaherty and Bacon did almost exactly the same things, but Bacon was always ahead of Flaherty. . . .

5—Doerflinger's Product Was Below Flaherty's Limit and Was Such a Lacquer as Flaherty's Patented Viscolac.

It was the express finding of fact of the District Court that Doerflinger's 415 solution has a viscosity characteristic of "approximately ½ second". The finding was based not only on the testimony of defendant's witnesses, but also on the testimony of plaintiff's witnesses, Clark and Schlatter "who made solutions from formulae in evidence (showing) that they got viscosities between ¼ and ½ seconds Hercules."

This Court says: "Doerflinger during reduction neutralized the agent, ammonia, by which he reduced viscosity. There is a dispute as to how far in the duplication of his experiments his moment of neutralization was observed."

But this dispute does not extend to the experiments and testimony of Clark and Schlatter.

With that point cleared up, the only thread of evidence that Doerflinger's 415 solution was not well within Flaherty's limit is this Court's deduction that Doerflinger's lacquers were not lacquers "such as Viscolac" because they did not preempt the new commercial fields that were subsequently broken into by the du Pont Company's Duco. . . .

6—The Limit of Viscosity-Characteristic of the Flaherty Patent Is Not Critical in Any Sense.

The evidence fully establishes—indeed it is admitted—that the covering power increases directly as the viscosity-characteristic of the nitrocellulose is reduced; and this was admittedly well known. It is also admitted that the toughness of the film made directly from a solution of nitrocellulose (containing no other ingredients than the nitrocellulose and its solvents) decreases progressively as the viscosity-characteristic of the nitrocellulose is reduced; and this was likewise well known.

Since the lower viscosity nitrocelluloses have become available the lacquer manufacturers have continued to choose, for particular lacquers, nitrocellulose of various viscosity-characteristics throughout the whole of the enlarged range, so that today the manufacturers choose their lacquer bases not within any particular critical range but throughout a range from the cotton of the lowest viscosity-characteristic commercially available up to and above the line of separation drawn in the Flaherty patent; so that there was nothing critical in that sense.

The fact is that for the generality of purposes to which nitrocellulose covering compositions were applied before the War (and the same is true in the extended fields of application made possible by lower viscosity-characteristic nitrocelluloses now available) the thickness of the coat desired (i. e., the concentration of nitrocellulose in the solution) is different for different purposes, and since nitrocellulose is a more costly ingredient of the composition, it is always wasteful to use a nitrocellulose whose viscosity-characteristic has been reduced too far for that particular purpose. To this fact of practical economics the practice of "blending" is due. . . .

It may be assumed that Flaherty, acquainted with this experience of the lacquer industry, knew that the very low viscosity nitrocellulose of his Example 1 could be made available by blending for many intermediate purposes for which the unblended product of that example would have too great a nitrocellulose concentration. Indeed the evidence is that the blended product of Example 1 is Flaherty's brush-handle lacquer, Viscolac, and the evidence also is, as we have seen, that Flaherty found, as

Bacon found with his Adamantine XX, that the full reduction of his Example 1 made the lacquer too thin for that particular use. . . .

So Flaherty, in his specification, pointed out that the product of his first example would be too low for most purposes. There was not in this or in any other part of his specification any intimation that there was a lower limit of viscosity reduction, or that brittleness had to be avoided.

7—It Is Not True That, as This Court Supposed, a Point Was Found by Flaherty, or Has Been Found by Anyone Else, Below Which the Resultant Film Is "Too Brittle To Be Corrected by Softeners."

In the District Court it was not contended by the plaintiff, at the trial or in brief or argument, and it was not suggested by the testimony of any witness, that Flaherty's patent disclosed in any way a lower limit of viscosity reduction. It is not surprising, therefore, that the District Judge who tried the case found, as a part of his full discussion of the facts, that "There is no evidence that any lower limit was discovered by Flaherty and none is described or claimed." It seems hardly fair to reverse the District Judge on that finding of fact, except on the most conclusive evidence. . . .

The most reduced viscosity-characteristic nitrocellulose referred to anywhere in the record is referred to as a "resin substitute" and was used in the Zapon Adamantine A-20 and Adamantine XX products. There is no suggestion that this "resin substitute" imparts to the final product any more brittleness—or that it counteracts any more the action of softeners—than resin does. Yet resins have always been made into sufficiently tough films by the addition of suitable oils and softeners. Mr. Bacon overcame the tendency of this very far-reduced nitrocellulose to produce brittleness by choosing a particular softener—triphenylphosphate.

This Court expressed the view that "it is a natural way to read the language to suppose that the 40% solution was indeed a lower limit, in spite of the verbal inappositeness of the phrase." If Flaherty had found, or supposed, that there was a lower limit below which viscosity-characteristic of the nitrocellulose should not be reduced, we would expect to find it within and not below the limits which to this Court seem to be suggested by this generalized resume of his illustrative examples. But, notwithstanding the fact that the point now under discussion was not in issue at the trial and proofs were not directed specifically to it, nevertheless the record does show quite certainly that the 40% solution mentioned in the patent does not mark a limit below which the film will be "too brittle to be corrected by softeners."

The fact is that this Court is wholly mistaken in the thought about a low point below which the brittleness cannot be overcome by softeners. This is a definitely erroneous finding of fact that should not, we submit, be permitted to stand uncorrected.

8—This Court Has Followed to a Conclusion Clearly Erroneous a Path That Is Closed By a Substantive Rule of Law.

Flaherty testified that the relationship between low viscosity nitrocellulose and covering power of the resulting lacquer and the economy of the use of such nitrocellulose in lacquers was known to him and to the art generally long prior to his invention. Wiesel testified that the knowledge that nitrocellulose lacquers of lower viscosity characteristic produce a lacquer of increased covering power led to a continuous pressure from lacquer manufacturers for lower and lower viscosity characteristic nitrocellulose. That the methods in common use for reducing the viscosity characteristic of nitrocellulose (prolonged boiling and high temperature nitration) were unsatisfactory because too expensive or too inefficient, is to be found here in the testimony of both Flaherty and Wiesel. See also Carlsson & Thall patent.

That all Flaherty and other lacquer chemists were looking for was an appropriate commercial method of reducing the viscosity characteristic of nitrocellulose below the range in common use is found here in the testimony of Flaherty and Wiesel.

The question is presented, therefore, whether when nitrocellulose of low viscosity characteristic was made commercially available by Pitman, Flaherty exercised invention in using such nitrocellulose for the purpose for which informed chemists knew it to be appropriate, or whether it was the non-inventive work of a skilled engineer, a part of his duty to the art, "the display of the expected skill of the calling" (*Thompson v. Boisselier*, 114 U. S. 1), and therefore in the public domain, incapable of appropriation by anyone; whether it was a "substantial discovery or invention" or the "natural and proper outgrowth" (*Atlantic Works v. Brady*) of the development of the lacquer art.

Great commercial success may sometimes, *in case of doubt*, resolve the question of invention in favor of the patentee, but it is settled such considerations have no influence where the patentee is seeking a patent for a mere matter of degree. As the Supreme Court said in the Langmuir suit, *De Forest Radio Co. v. General Electric Co.*, 283 U. S. 664,685: "Only when invention is in doubt may advance made in the art be thrown in the scale to support it."

For as between unjustifiably depriving the public of a thing which many want to use, and of a thing which few want to use, surely the former is the more serious error.

No case on this point can be more striking than the case just cited. In his decision of that case in the District Court, finding the Langmuir tube unpatentable, Judge Morris nevertheless characterized it as the tube "which because of its stability, reproducibility, and power, *has made possible radio broadcasting*, modern radio reception *and long-distance telephony*."

The Supreme Court itself said, "That the high vacuum tube was an improvement over the low vacuum tube of great importance, is not open to doubt."

But the Supreme Court held that this improvement "of great importance," this improvement which the trial court found, as a fact, lay at the basis of two great modern arts of enormous commercial, cultural and humanistic value, was not patentable—because its production was the work of the engineer and not of the inventor.

Disregarding for the moment all of the specific anticipations above discussed, our position is that *as a matter of law* what Flaherty did was not an invention over the general knowledge which this Court found existed in the art; that at most his work was that of the normal "man skilled in the art," the engineer; not that of the inventor.

This Court has found that "all that Flaherty did was to carry out what was already known, and by trial and error to fix the limit which should be observed".

It is an *inventor* who is to be rewarded, not the engineer. The man skilled in the art owes a duty to that art; the man who designed the George Washington bridge presumably exerted extraordinary skill and judgment; presumably mankind owes to him much more than it owes to the inventor of a new mousetrap. But to design even such a great work as the bridge is the work of the engineer; important and difficult as that work is, it is not rewarded by the grant of a monopoly, unless invention is present. The "flash"—the "creative mental conception"—must be there; that makes the mousetrap an invention; no amount of skill, ingenuity, daring and judgment can make the bridge an invention without it.

And if there is anything that an engineer owes his art, it is, we submit, to "carry out what was already known, to fix by trial and error the limit which should be observed". Every cable and every beam in that bridge was fixed by trial and error, or calculated from the results of some past trial and error. Such is the daily work of any designer.

So in *Spill v. Celluloid Mfg. Co.*, Judge Blatchford held a patent invalid where he found that the patentee had merely experimented to find out what were "the limits to be observed" in the strength of alcohol used in dissolving nitrocellulose.

And in *In re Wells*, dealing with an alleged process invention proved to be of value and to have been arrived at as a result of elaborate laboratory tests, said, "This case is quite analogous in principle to that of In re Richter, —That case involved certain claims for new preparations in acid sulfite cooking liquor used in the production of wood pulp. We there held that changes in proportions of agents used in combinations, such as were there involved, in order, to be patentable, must be *critical* as compared with the proportions used in prior processes. We there pointed

out that such was the doctrine of Minerals Separation, Limited, et al., v. Hyde, which case was there relied upon, as it is here."

We pointed out that the reduction in strength and increase in brittleness resulting from the use of nitrocellulose of low viscosity characteristic is an inherent condition that must be accepted, a sacrifice which must be made, to increase the covering power—a sacrifice which may be mitigated by the intelligent use of oils, resins, etc.

The Court found the question of fact in our favor; it said that Flaherty's patent "left the art to its own devices as to * * * how by the addition of oils and resins to make the coat tough and adhesive." We would have assumed that, this issue of fact having been decided in favor of defendant, the patent would necessarily and inherently be declared invalid; there seems to be no issue of law between the parties.

The Court has now decided that the "erroneous assumption" which according to plaintiff's brief caused the "lower Court's inability to distinguish" the *Langmuir De Forest* case was not an erroneous assumption at all, but a correct statement of fact; that the lower Court's "fundamental misunderstanding of the problem" was actually an acute and accurate comprehension of the problem.

Nitrocellulose existed in the prior art of various viscosity characteristics. "Once known" that decreasing the viscosity characteristics increased the covering power "it did not need the genius of the inventor to recognize and act upon the truth" that better lacquer could be made by using the nitrocellulose of low viscosity characteristic—which is all that Flaherty did, for we again remind the Court that Flaherty did not make Duco. Duco, the automobile lacquer, did not exist until Hitt had properly applied and proportioned the oils, softeners, etc. All that Flaherty did was to use Pitman's nitrocellulose as others had used other nitrocellulose. Even this he was taught to do by knowledge which the Court finds existed in the art, for, as the Court says, "the relation between viscosity and coverage was well known".

Claims 12 and 17 Necessarily Invalid

The District Court held claims 12 and 17, defining articles coated with the patented lacquer and enamel, invalid upon the authority of *Underwood v. Gerber*, 148 U. S. 224. The opinion of this Court mentions that the patent in suit is not only for a lacquer, but also for articles coated with it, and makes no exception in favor of claims 12 and 17 in its conclusion that the decree of the District Court be reversed. However, there is no discussion of the validity of these claims in the body of the opinion. This circumstance, coupled with a conviction that the decision of the Supreme Court in *Underwood v. Gerber*, requires a finding that there can be no invention in applying lacquer or enamel to an "article" or to a "rigid article," leads us to suggest that this issue may have been overlooked.

Respectfully submitted, William H. Davis, Albert G. Davis, Daniel V. Mahoney, George E. Faithfull, Chas. W. Riley, Counsel for Petitioner.

Brief for (du Pont) Plaintiff-Appellant

There is no dispute about the fact that for more than twenty years prior to Flaherty's invention it had been known that the viscosity characteristic of nitrocellulose could be reduced in many ways, including the very process used for reducing the viscosity of the nitrocellulose contained in Defendant's lacquer. Reducing the viscosity characteristic means changing the molecular structure of the nitrocellulose in such a way that more of it can be dissolved in the same quantity of solvent without making the solution any more viscous.

Defendant contends that such knowledge enabled any skilled engineer, who set his mind to the task, to produce a lacquer such as Flaherty's Viscolac. But, as this Court found, history shows conclusively that it did not.

The difficulty was that a lacquer coating, to be of any practical use, must withstand abrasion, forceful contact, and be generally lasting in service. But a decrease in the viscosity characteristic of the nitrocellulose involved a decrease in the strength of the resulting coating, other things being equal, and, when the viscosity characteristic was reduced too far, "the coating would break, it would lack strength, it would lose its cotton (nitrocellulose) characteristic and become more resinous and brittle."

Furthermore, in any paint and varnish substitute nitrocellulose lacquer, *resin* is an indispensable ingredient; if, in order to use nitrocellulose of low viscosity, resin had to be omitted, not only would the adhesion of the lacquer to wood or metal be fatally deficient and the lustre impaired, but also there would be little, if any, gain in the covering power of the lacquer since the contribution of resin to the thickness of the coating is of the same order as the contribution of the nitrocellulose. The mere substitution of low viscosity nitrocellulose for resin would not increase the covering power. The effect of adding resin to nitrocellulose lacquer, as was well known and as brought out in detail in the Atlas reports, was to weaken the nitrocellulose and make the coating brittle and further limit the amount of softener that could be added without making the coating so soft that it marred easily on rubbing. . . .

History shows that it was far from obvious to those skilled in the art that nitrocellulose of low enough viscosity characteristic to yield the thickness of coating required for a paint and varnish substitute (*i. e.*, one below about 4.6 seconds Hercules) could be blended with resin and softener to produce a coating of practical hardness, toughness, durability, and adhesiveness. In spite of the strongest incentive to make such a lacquer, it was not produced. As the Atlas engineers wrote when Flaherty's Viscolac came to their attention, such a lacquer had "been *unheard of* in lacquer finishes until the Viscolac came on the market".

The blending of nitrocellulose below a certain viscosity limit with old resins and softeners to produce a lacquer was invention just as the Supreme Court said that blending starch, degenerated to have a viscosity below a certain limit but not too low, with old ingredients used in starch glue was invention in the *Perkins Glue case*. As the Supreme Court said, a new *composition* of matter was made, in spite of the fact that degenerated starch and how to degenerate it were known.

The secret of Flaherty's success was, as this Court held in its Opinion, the discovery that nitrocellulose having a viscosity characteristic below 4.6 seconds Hercules, but not too low, could be blended with resin and softener to produce a coating which was thick enough for a paint and varnish substitute and at the same time sufficiently hard, tough, durable and adhesive. Flaherty's discovery and selection of the proper viscosity, as this Court pointed out, followed a careful investigation of the lacquer properties of nitrocellulose of different viscosities. That does not detract from the merit of his invention. An invention is usually the result of hard work. . . .

Doerflinger selected viscosities so high that his lacquers did not differ appreciably from the ordinary high viscosity lacquers of his time in respect to the thickness of coating they could produce.

Atlas unquestionably failed to discover that resins could be used with nitrocellulose within Flaherty's range of viscosities, in spite of the fact that it was striving to make a paint and varnish wood finish substitute and their experience showed that resins were indispensable for that purpose.

The patent in suit describes a practical lacquer comprising low viscosity nitrocellulose, resin and softener, suitable for use as a paint and varnish substitute for the finishing of wood or metal, and to it the claims in issue are directed.

One fundamental error, which runs throughout Defendant's Brief, is the entirely erroneous assumption that the claims in issue are not directed to a practical paint and varnish substitute useful as a wood or metal finish. Thus, Defendant erroneously says that the claims in issue are for a "nitrocellulose lacquer and enamel in which the nitrocellulose ingredient used has a viscosity characteristic lower than 4.6 seconds Hercules, *no matter what other lacquer ingredients are used in composing the lacquers or enamels.*" This statement is directly contrary to fact since all the claims in issue require the combination of a *resin* with the nitrocellulose and most of the claims require the use of softeners.

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Starting with 1934, we shall serve these readers better by establishing a new department under the above heading. No other publication in the country devotes so much time and space to these new materials, and we shall pay particular attention to the heavy dopes used as coatings and impregnating materials. No other paper is better equipped to handle these materials more effectively editorially, or to tell the new developments promptly and support and extend the new uses of all plastics in solution.

Plastics in

Meet Tom Thumb, Jr., Tom Thumbest of all decorative radios—certainly a little humdinger, and a welcome addition to any room in the house. The five tube set, encased in a lustrous black Durez cabinet, is said to have remarkable pick-up and tone value, and was designed to take fullest advantage of the molded material. Announced by Automatic Radio Mfg. Co. and molded by Waterbury Button Co.

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A pocket full of entertainment at hand to drive dull care away. The new Kadette "Jr.," weighing but two pounds—the first complete radio receiver designed to slip into an overcoat pocket. International Radio Corp. have employed a new radio circuit, involving the use of two tubes. The receiver delivers amazing volume, possesses exceptional clarity of tone, and the compact mechanism is housed in a striking Bakelite Molded cabinet molded by Chicago Molded Products.

At the recent Ford Motor's "Thirty Y held in Detroit, Durez Ford parts wer above photograph. Another promising in the applications of these materials

s in Pictures

or the electrical industry—well—look here, and if this isn't clear enough, ive and ten and see how Woolworth features Bakelite as the basic material e in their stores—and this doesn't begin to tell the story of what the future

Motor's "Thirty Years of Progress" exhibition ez Ford parts were exhibited, as shown in the Another promising field for plastics is held out f these materials to automobile parts.

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The *resin* is a vital and indispensable element in a lacquer for use as a paint and varnish substitute.

Again, Defendant insinuates and assumes that the lacquer described in the patent in suit is not a practical lacquer for finishing wood or metal as a paint and varnish substitute. This insinuation and assumption are directly contrary to the uncontradicted evidence in the record, as we shall now point out.

The evidence on that point is as follows:

Dr. Little, a man whom Defendant admitted to be of the highest reputation and well qualified to make the tests, followed strictly the instructions of the patent in suit (all of which were contained in the original application), and produced lacquers which were applied to mahogany panels as a wood finish and to steel panels as a metal finish and demonstrated that the exact lacquer of the patent in suit was an excellent paint or varnish substitute for both wood and metal finishing.

This evidence is not only uncontradicted, but is confirmed by Defendant's witness Zucker, who testified that he prepared a nitrocellulose base solution strictly in accordance with the instructions of the Flaherty patent and compounded it with damar resin and softener substantially as described in the Flaherty patent, and further testified that it made a very satisfactory furniture finish. In making this lacquer Zucker used a little solvent softener in place of a portion of the castor oil softener which is specifically described in Flaherty's patent, but Zucker did not suggest anywhere in his testimony that his product would not have been just as satisfactory if he had omitted the solvent softener and used exclusively the castor oil or other blown vegetable oil softeners specifically mentioned in the patent in suit.

The only basis in the record, which Defendant finds for any criticism of the excellence of the lacquer of the Flaherty patent, are the statements in the file history of the Hitt patent, to the effect that on surfaces subjected to continuous flexing and weaving, for which a coating of high retention of flexibility is desired, the use of Hitt's solvent softener in place of Flaherty's castor oil softener helps to retain such high flexibility better after prolonged aging of the coating. Though this improvement in retention of flexibility on prolonged aging was useful in the automobile field, it was merely an improvement grafted on the Flaherty invention. But, as the quotation in Defendant's Brief points out, Flaherty's lacquer without Hitt's solvent softener is just as satisfactory in the furniture field, etc., that is, on any wood or metal surfaces "that are not subjected to a continued flexing or weaving".

Of course, in the automobile field also, Hitt's improvement would have been useless without Flaherty's invention. Indeed, he only claimed, as shown by his file history, that solvent softeners were useful in lacquers of the Flaherty type.

As we pointed out in our original brief, Defendant's attempt to credit the success of automobile Duco exclusively to Hitt's improvement is strictly analogous to defendants' attempt in the *Tungsten Lamp Cases* to credit the success of the tungsten lamp exclusively to Coolidge's drawn wire process and thoria stiffener, which improvements, like Hitt's, prolonged the life of the product of the patent in suit. In the *Alexander case*, this Court disposed of that contention, saying: "Tungsten of that kind is functioning just the same with or without the mechanical thoria stiffener. This is true, no matter whether the slender thread of incandescence is made by Just and Hanaman, or by Coolidge; by this plaintiff, or these defendants."

Furthermore, as this Court notes in its Opinion in the present case, Flaherty's Viscolac excited the art and competitors reported it displacing their products before Hitt's improvement went into use. Defendant argues, that Flaherty's lacquer first went into use in old lacquer fields and that the opening up of the automobile field came later after Hitt's improvement had been made. But the fact that Flaherty's product first went into use and displaced competitors' products in the old lacquer fields merely emphasizes the fact that the stimulus to produce such a lacquer as Flaherty's had always been present, and that it was beyond the skill of the art to do it. Moreover, when it went into use in old lacquer fields, it not only replaced the lacquer coating, but also paint and varnish coatings previously used to supplement the lacquer coating. . . .

As we pointed out in detail, Doerflinger from 1913 to 1919 used a so-called "415" solution in compounding the lacquers the Perry Austen Company sold during that period. The voluminous records produced by Defendant contain no direct evidence as to what was the viscosity characteristic of the nitrocellulose in this "415" solution. Doerflinger testified, and his records showed, that he reduced the viscosity of his "415" solution by adding to it a definite proportion of ammonia and letting it stand with intermittent stirring and sometimes with occasional heating until in Doerflinger's judgment the viscosity looked right, whereupon he stopped the reduction by *neutralizing the unconsumed portion of the ammonia with acetic acid*. In each of the only three runs of "415" which are recorded in Doerflinger's notes, two-thirds of the ammonia originally added was neutralized with acetic acid at the stopping point; *i. e.*, the reduction was stopped when only one-third of the ammonia originally added had been consumed.

As To the Doerflinger Defense

In alleged repetitions of Doerflinger's "415" procedure by Defendant's experts Battle, Zucker, and Stern, the ammonia reduction was carried on at such temperatures and for such times that, in the case of Battle and Zucker, *all* of the ammonia was used up, and in the case of Stern three-quarters of the ammonia was used up. This contrasts sharply with Doerflinger's practice of stopping the reduction when only one-third of the ammonia was used up. Battle, Zucker, and Stern, having carried the ammonia reduction very much further than Doerflinger, inevitably produced a product of much lower viscosity than Doerflinger. So their tests prove nothing as to what Doerflinger had made.

Defendant asserts that the nitrocellulose in Doerflinger's "415" solution must have had a viscosity characteristic of one-half second Hercules because that is what Battle, Zucker and Stern obtained in their "415" experiments. Defendant makes no attempt, however, to explain the above mentioned fatal defect in the tests of Battle, Zucker and Stern, in spite of the fact that this Court had pointed out that the viscosity obtained in the duplication of Doerflinger's experiments depended upon how far Doerflinger's point of stoppage of the reduction by neutralizing the ammonia was observed, and that in this respect Defendant's proof was unsatisfactory.

Instead, Defendant argues that this discrepancy does not apply to the tests of the "415" procedure, specified in Defendant's Bill of Particulars, made by Plaintiff's witnesses Clark and Schlatter, in which tests they obtained nitrocellulose of half second Hercules or less. The trouble with Defendant's argument is that Doerflinger did not do what the Bill of Particulars specifies. . . .

The Doerflinger lacquers were sold by Perry Austen from 1913 to 1919 without any customer or competitor noticing any difference in covering power between them and the other lacquers of the time. Many customers testified that these lacquers were just like the other lacquers of the time, were used interchangeably with other lacquers, were thinned and applied in the same way, and were used only for the same old purposes. Furthermore, when in 1919, Doerflinger *discontinued* the use of "415" and *substituted* ordinary 10 to 20 second nitrocellulose (far above Flaherty's limit) in these lacquers, the lacquers continued to serve the same purposes. If the Perry Austen lacquers had used nitrocellulose of a viscosity within Flaherty's limits, their unusual covering power would inevitably have been recognized. The history of the Perry Austen lacquers is in sharp contrast with the history of Flaherty's Viscolac where the unusual covering power was at once recognized by customers and competitors. . . .

The net significance of the Doerflinger defense is, as this Court indicated, to show clearly that Flaherty's invention was not obvious even to a skilled lacquer chemist like Doerflinger who had turned his attention to the problem of using nitrocellulose of reduced viscosity characteristic in lacquers and enamels.

Jones, the general manager of the Atlas Company, in May, 1919, submitted to Bacon the following problem: "In connection with finishing of wood, we have a *problem* of getting a heavy coating with a single application; about 6 oz. of cotton per gallon is as

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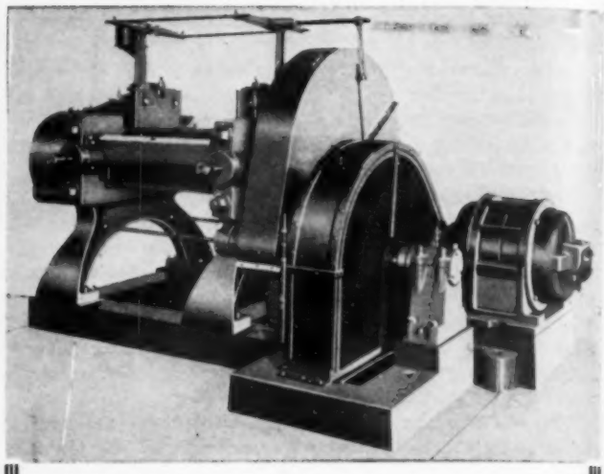

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heavy as we can work. When a coating of this is applied and is compared with a coating of shellac solution running 3 lbs. shellac per gallon, naturally, our material looks as though we had almost no coating on the wood."

In this same letter Jones suggests trying a low viscosity nitrocellulose solution with resin but points out that the resin "might complicate the result".

That "*problem*" baffled the lacquer industry from its inception until Flaherty provided the answer. The record is clear that neither Bacon nor anyone else connected with Atlas was able to solve it; Atlas finally in 1922 copied Flaherty's commercial lacquers.

Defendant does not pretend that Atlas solved this problem. Defendant's contention that Atlas anticipated Flaherty rests upon the erroneous assumption that Flaherty did not solve this problem; that is, that the lacquer described in Flaherty's patent and claimed in the claims in issue is not a practical lacquer suitable for use as a paint and varnish substitute on wood or metal. This assumption is directly contrary to the conclusive and uncontradicted evidence in the case, as we have shown. Moreover, in this connection Defendant erroneously assumes that resin is not a material element of the claims in issue. . . .

Whether or not Flaherty is entitled to a claim for the use of a pyroxylin solution of low viscosity which can be used directly as a lacquer without the addition of resins, is not here in issue. But we note in passing that neither Bacon nor anyone else referred to in the record anticipated Flaherty in discovering a pyroxylin solution of a viscosity characteristic below 4.6 seconds Hercules which could be used directly as a lacquer. The record does not show that any pyroxylin solutions of reduced viscosity which Bacon, before Flaherty, tried to use directly as lacquers without additions of softeners could be so used. They were so low in viscosity characteristic that they *automatically cracked on drying*, as he states in his reports.

We need not enlarge further upon the question of low viscosity solutions used directly as lacquers because it is not here in issue. We are here concerned only with lacquer in which nitrocellulose below 4.6 seconds Hercules in viscosity characteristic is combined with resin to yield a hard, tough, durable, adhesive coating. The record shows that resin is combined with such low viscosity nitrocellulose in Plaintiff's Viscolac and Duco and in Defendant's lacquer. It discloses no lacquer useful as a paint or varnish substitute which does not contain resin.

The history of the Atlas work proves that resin is absolutely indispensable in a wood or metal finish capable of use as a paint or varnish substitute and that the Atlas chemists, although they recognized the importance of resins, did not succeed in combining them with low viscosity nitrocellulose to make a practical wood or metal finish.

This patent merely discloses the fact that the viscosity characteristic of a nitrocellulose solution can be reduced indefinitely by heating the solution under pressure. Also, Bacon in his work followed the exact time and temperature specification of the only example given in the patent and obtained the extremely brittle product that he later named "Adamantine Resin". Further Carlsson & Thall made no mention of lacquer in their application as filed, and the only mention of lacquer in the patent is in the claims taken from Bacon's abandoned application and issued in the Carlsson & Thall patent after the Atlas Company bought it. Finally, the patent contains no information that the Atlas chemists did not have, and their failure to arrive at Flaherty's lacquer is clear and contemporaneous proof that the Carlsson & Thall patent did not contain sufficient information to guide skilled lacquer chemists to Flaherty's result.

The disclosure and claims of the Flaherty patent are sufficiently definite with respect to viscosity limits. The patent points out, "By following the procedure set forth in the above examples a 25 to 40% pyroxylin solution may be obtained having a viscosity below 25,000 centipoises."

As the Court points out in its Opinion, the natural way to read this language, in spite of the verbal inappositeness of the phrase, is with the meaning that nitrocellulose solutions from 25 up to 40% concentration, having a viscosity of not over 25,000 centipoises, may be made. By stipulation the 25% solution of that viscosity is equivalent to 4.6 seconds Hercules and the 40% solution of that viscosity is "about .2" seconds Hercules. This gave the art a practical working range of nitrocellulose viscosity characteristics useful in the new lacquer.

All of the claims in issue specify in equivalent units that the nitrocellulose viscosity characteristic must be "below" 4.6 seconds Hercules. Defendant criticizes this upper limit on the ground that it is not "critical" because no radical change in the qualities of nitrocellulose occurs at 4.6 seconds Hercules, if the viscosity is raised or lowered through that point. We agree that it is not critical in that sense, and the authorities are clear that it need not be critical in that sense. It is enough that it sets a practical boundary line to the new field discovered and claimed by Flaherty. . . .

Defendant contends that the absence of an express minimum limit in the claims renders them invalid; but the authorities are clear that no express minimum limit is necessary. For instance, in *Minerals Separation v. Hyde*, the process claimed the use of oil, for producing froth flotation, "amounting to a fraction of one per cent. on the ore" and did not specify in the claims any minimum fraction.

Defendant, submits an affidavit by Nixon of the Hercules Company, to the effect that he "knows of no known limit beyond which this reduction in viscosity cannot be carried and the resulting brittleness cured by the addition of softeners." In making this sweeping statement he must be giving a very narrow interpretation to the expression "known limit," or else must be disregarding the effect of softeners on properties other than brittleness. Nixon also states that the Hercules Company sells a one-eighth second nitrocellulose and that, on information and belief, it has been used unblended by Hercules' customers in the manufacture of lacquer. It is notable that he does not say to what extent or with what success it has been used unblended. Finally he states that Hercules has formulated "usable" lacquers "*containing*" nitrocellulose of a viscosity characteristic as low as .005 seconds Hercules, but he does not say that it was unblended or what proportion was "contained".

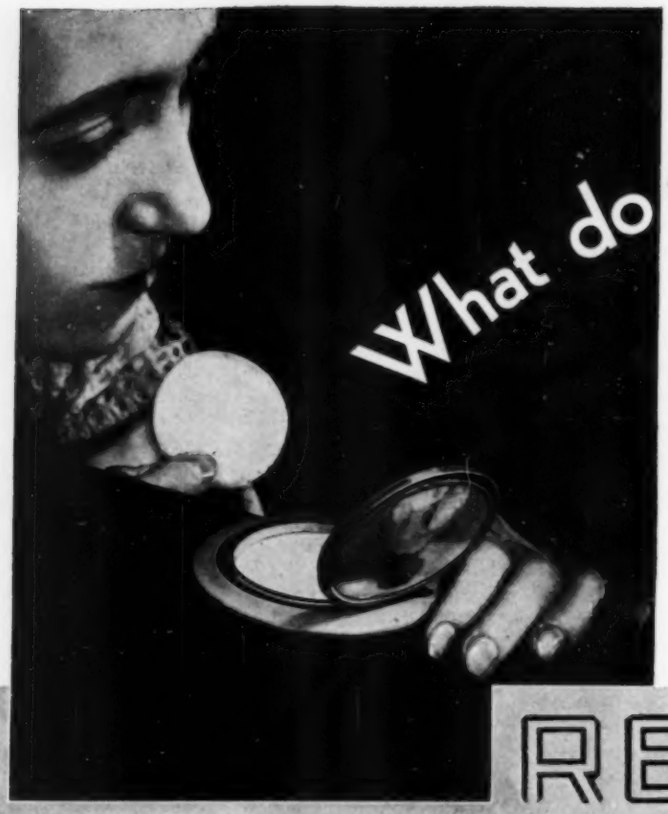
As to the Law Respecting Invention

The substance of the testimony is that, before his invention, Flaherty's state of mind and, so far as he knew, the state of mind of others, was such that he and they approached the problem with an entirely mistaken viewpoint as to where the solution was to be found, erroneously believing that some new process would have to be found that would make a new kind of nitrocellulose "free from defects".

But the solution of the problem did not require any new method. The solution lay in discovering and selecting a proper viscosity characteristic that could be combined with resins and softeners to yield a thick and at the same time a practical coating. Such nitrocellulose could be made by any number of old methods if the reduction was stopped at a proper viscosity characteristic.

Prior to Flaherty's invention neither Flaherty nor anyone else knew that. That solution of the problem eluded the entire art until Flaherty demonstrated the fact.

Defendant alleges, that claims 12 and 17, which are directed to the applied coating, as distinguished from the other claims in suit which are directed to the lacquer, are invalid upon the authority of *Underwood v. Gerber*, 149 U. S. 224. That case has no application to the present situation because Flaherty did just what the Supreme Court, in that case, held the inventor should have done; that is, put his claims to the coating material and to the applied coating it produced, in the same patent. In *Underwood v. Gerber* the inventor had devised a new coating for carbon paper. In one patent he claimed the material for coating the carbon paper and in the second patent he claimed the coating applied to the paper. Only the second patent was in suit and the Court held the second patent was invalid since it was for the same invention as the first patent. There is no suggestion in *Under-*



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wood v. Gerber that the claims for the carbon paper would not have been valid if they had been put in the same patent with the claims for the coating material. In fact the Court intimated that the second patent might have been sustained if the earlier patent had also been declared upon in the same suit and treated as part of the same invention. In the present case both types of claims are in the same patent and both are in suit.

Hardness, toughness, and adhesiveness are physical properties of the coating and are, accordingly, proper and important limitations in claims for the coating. They exclude nitrocellulose of such low viscosity characteristic as to destroy those physical properties.

An inventor has the right to claim his invention from various aspects. In Flaherty's case, both the lacquer and the coating it produced were new, although they were essentially parts of the same invention. He had the right in the same patent to claim both, just as any inventor may claim in the same patent a new product in its intermediate and final stages.

Charles Neave, Maxwell Barus, Paul R. Ames, J. B. Cunningham, Of Counsel for Plaintiff -Appellant.

The Judges' Decision

WE HAVE again examined the record as to Doerflinger's prior use in 1913-1919, and are still of opinion that it was not adequately proved. We may assume that he did on occasion reduce viscosity below Flaherty's limit, but what he used, except experimentally, was solution 415, and the viscosity of that is most uncertain. Doerflinger used acetic acid to stop the reaction of ammonia, the reducing agent; the more ammonia that combined, the greater the reduction in viscosity. He added enough acetic acid to neutralize two-thirds of the ammonia; and after its addition the solution was neutral, not acid. The defendant's experts allowed either all the ammonia, or much more than a third to combine; Schlatter, one of plaintiff's witnesses, after adding the amount of acetic acid specified by Doerflinger, found that the result was acid; more than a third of the ammonia had been used. Naturally there was a greater reduction of viscosity. Clark, the other, did not test to see whether the solution was neutral or not. Moreover, the temperatures of Doerflinger's experiments could not be reproduced, as they were not accurately measured at the time, and, besides, his memory was not reliable after nearly twenty years. Therefore, whatever Doerflinger did, it is not definitely proved that he discovered a lacquer suitable in other respects, and of thick covering, produced by keeping within 4.6 seconds viscosity. If in his experiments he chanced upon some such, it was not an anticipation, unless he came to rest upon a formula which contained the elements of the patented composition. Lacquer made under formula 415 made no impression upon the art, either by its appearance or disappearance; and it is improbable that this would have been so, had it been that composition which in 1921 was at once recognized as a new and important advance. This circumstance fortifies our doubts as to the identity of the two, as it did before.

As to Bacon's use it is clear that, regardless of Flaherty's date of invention, Adamantine X was not the patented product. It was the culmination of a series of experiments originating in Adamantine Resin, which Bacon thought would be a substitute for true resins. It contained none, because at that time Given says that they did not believe that ordinary resins could be successfully combined with low viscosity nitrocellulose. Probably in 1919 they had thought that it could, but the results had not been satisfactory, and when Bacon took up the investigation again in July, 1920, they did not believe that he had yet solved the problem, certainly as to wood finishes. As to lacquers of other kinds, if indeed the difference is as important as the defendant would have us believe, his results, judging by his reports, were still experimental and somewhat equivocal. For example, the report of October 27, 1920, was based upon high viscosity nitrocellulose, with which they were, therefore, still working. We cannot regard all this taken with the later omission of all resins, as compatible with more than tentative earlier results. Besides, the declarations of the Atlas Company itself, when Viscolac appeared, ought to lay any doubt that what Bacon succeeded in producing was not Flaherty's lacquer.

Upon the issue of invention we have little to add to what we said before. Except for claim one, all the claims are for compositions of nitrocellulose and resin; most of them with a softener added. The invention, so far as we need consider it, is not for a low viscosity nitrocellulose; not even for a lacquer made of low viscosity nitrocellulose. Our emphasis upon the new element in our opinion has apparently misled the defendant into supposing that we thought the patented lacquer was only a nitrocellulose product. It was not; it was a lacquer made with gums or resins, and normally with a softener. Bacon at least had been led away from such a lacquer, as we have just said; he thought that it would not be tough, hard and adhesive. Whether the art generally supposed so, does not appear, but such a lacquer with great covering power would have got wide acceptance. If Flaherty did no more than disabuse the art of a misconception, it is evidence of originality; most of us persist in what we are accustomed to believe. Though all he did was to carry forward the existing knowledge that lower viscosity would result in greater coverage, other competent persons had tried to use that knowledge; the stimulus to success was great, and the art had been either strangely inert, if the combination was obvious, or else obsessed with a belief that low viscosity was impracticable. The result was a new and unexpected product, recognized as such, and used to much advantage. We know of no rigid doctrine, divorced from those practical considerations which rightly or wrongly are basic in the patent law, that forbids to such an advance the name of invention. If authority is needed, Holland Furniture Co. *v.* Perkins Glue Co., 277 U. S. 245, will serve. There it was known that by degenerating starch its absorptivity would diminish. All Perkins did was to stop the process before dextrine, which gave bad adhesion; and that was an invention, though he did not claim it. The situation is here reversed; instead of stopping a known process to get a new result, Flaherty extended one. That his limit is not absolute is no objection; though at first hazy as to the precise boundaries, he had always, fixed a safe upper limit, and that was enough. Nor do we agree that, at least on this record, we were wrong in saying that there is a lower limit to which viscosity should not extend; it is true that the resulting brittleness can be corrected, but there is at least some evidence that the necessary softeners make the lacquer impracticable. In any case the point is unimportant, for no lower limit is necessary to the validity of the patent, and we have not found that there was any.

We did not mention Carlsson and Thall's patent, because it seemed to us irrelevant, since it added nothing to Bacon's work. The specifications are only for the preparation of low viscosity nitrocellulose. The last two claims, which were borrowed from Bacon, do indeed imply that such nitrocellulose may be used for lacquers; but the question whether the nitrocellulose described was to be used alone, or made an ingredient with resins and the like, is left wholly at large. This at best left the art just where Bacon's own experiments left it. Unless we beg the whole question by assuming that the unanswered question was unimportant, the disclosure was irrelevant; and even if we do not, it would scarcely be full enough.

We cannot see that Underwood *v.* Gerber, 149 U. S. 224, affects the validity of claims twelve and seventeen; it did not hold that a single patent might not contain claims both for a composition of matter, and for articles in or on which it was used. It is not indeed apparent how a patentee gains anything by such claims; the article is already covered by claims for the composition, if it contains the composition. On the other hand, though such claims may be idle, they do not expand the monopoly, which covers all uses of the composition anyway.

We failed to notice that the disclaimer included lines two to nine of page three, but the argument is stronger with these out.

We adhere to our original decision and the decree is reversed.

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Plastics in the News

Plastics Industry at the Chemical Show — Round-Table a Success — Trigg Heads New National Association — Du Pont Victor Over Glidden in Rehearing — Hercules Has New Resin — Colt Declares Salary Bonus.

Plastics industry will have an important place in the 14th Exposition of Chemical Industries opening at the Grand Central Palace in N. Y. City on Dec. 4 and continuing for 1 week. No industry has made greater strides in the past 3 years than has that of the plastics industry. Despite the depression the advances made in the period since the holding of the last show have been numerous and of great importance. These will be displayed prominently. In addition, the Exposition will bring to light many improvements in machinery and equipment that will appeal to a large number connected with production.

Those interested in the plastics field will be interested in the collection of new products and chemicals to be displayed at the PLASTIC PRODUCTS' booth, Number 28, on the main floor.

Plastic industry members will find the following booths of special interest:

Company	*Booth*
American Catalin Corp.	45
Bakelite Corp.	17
Carbide & Carbon Chemicals Co.	78
Carver, Fred S.	211
Catalazuli Mfg. Co.	269-270
Celluloid Co.	209
Commercial Solvents Corp.	2
Continental-Diamond Fibre Co.	31
Dow Chemical Co.	76-77
Eastman Kodak Co.	56
General Electric Co.	3-4
General Plastics, Inc.	71
Glyco Products Co.	299
Haveg Corp.	51
Hercules Powder Co.	206-207
Marblette Corp.	323-324
Quaker Oats Co.	274
F. J. Stokes Machine Co.	80
Sharples Solvents Corp.	92
Union Carbide Corp.	78-79
U. S. Industrial Alcohol Co.	48

Fabricators' Code

A code for the plastics fabricators moved closer to realization in the past month. Executive committee of the Plastics Fabricators' Association met in N. Y. City on Nov. 16 and approved a revised code which was submitted to the entire membership at a meeting held at the Chemists' Club in N. Y. City on Nov. 27. Revised code prepared by the committee embodied several changes that were thought desirable after the committee met with NRA officials in a preliminary and informal hearing.

Raw materials group, which is affiliated with the Chemical Alliance through individual company signatures to the Alliance's code, continued to watch developments in that direction. Despite the strenuous efforts of the committee and the rewriting of the so-called "merit-clause" several times, little headway appeared to have been made in reaching a satisfactory agreement with NRA officials so that the code might be sent to the President for signature. At a press conference held on Nov. 17 Administrator Johnson is reported, however, to have stated that he had conferred with Francis P. Garvan, industrial advisor of the chemical code, and that the code would very shortly be ready for final approval.

British Plastics Exhibition will remain open at the Science Museum until Jan. 15, 1934.

Round Table on Resins

A very successful Technical Round Table on "Synthetic Resins" was held Nov. 14 by The American Institute of the City of N. Y., in the Institute rooms in the Lincoln Bldg. Dr. C. R. Downs, member of the consulting firm of Weiss & Downs, acted as leader, and Dr. George Barsky, until recently acting chief technologist for Cyanamid and now a consultant with offices at 52 5 ave., N. Y. City, was the guest authority.*

Others attending included: Howard Farkas, vice-president, U. S. Stoneware Co.; F. C. Breen, DuPont Paint Co.; R. Abben and H. J. Barrett of the same company; C. O. North, Dr. J. W. Weiss; James A. Lee, managing editor, *Chemical and Metallurgical Engineering*; Dr. Joseph F. X. Harold; Donald C. Dow; Joseph W. Spieslman, Weiss & Downs; Leon V. Quigley, public relations consultant; F. S. Granger, patent lawyer connected with Dr. William M. Grosvenor, Chemists' Club Bldg., N. Y. City, and Robert C. Gilmore, Jr., PLASTIC PRODUCTS.

P. A.'s Exposition

Plastics industry was represented by Celluloid Corp., the Brown Co., and Spaulding Fibre at the 1-day exhibit and annual dinner of the Purchasing Agents' Association of N. Y., held on the Roof Garden of the Hotel Pennsylvania. A number of articles molded of Bakelite were shown by Bates Mfg. Co. (manufacturers of date stamps, clipping machines, date pads, etc.). One particularly fine piece of molded was that of a complete holder from a desk calendar-pad. John B. Kennedy substituted for Edwin C. Hill as the principal speaker at the dinner.

Possible Business?

Chinese firm is contemplating the manufacture of synthetic resins and wishes to obtain quotations from U. S. producers of phenol, formaldehyde, and wood flour. Accredited American firms interested may obtain name of the inquirer upon application to the Chemical Division, Bureau of Foreign and Domestic Commerce, Washington.

September Paint, Varnish and Lacquer Statistics

September sales of paint, varnish and lacquer products totaled $19,097,803 in value (586 producers). This compared with $20,620,811 in August and $16,805,712 in September last year. January-September sales were $171,426,583, against $165,753,600 in corresponding period of 1932.

		Classified sales reported by 344 establishments				
		Industrial sales			*Trade sales of*	
1933	*Total sales reported by 586 establishments*	*Total*	*Paint and varnish*	*Lacquer*	*paint, varnish lacquer*	*Unclassified sales reported by 344 establishments*
1933—Jan....	$11,275,396	$3,529,886	$2,386,947	$1,142,939	$4,168,260	$3,577,250
Feb....	11,665,734	3,423,033	2,445,378	977,655	4,771,706	3,470,995
March.	13,578,568	3,391,947	2,484,550	907,397	3,788,213	4,398,408
April..	19,043,787	4,677,309	3,143,803	1,533,506	8,582,411	5,784,067
May...	26,241,044	5,991,938	4,298,455	1,693,483	11,788,573	8,460,533
June...	27,813,233	6,827,509	4,832,551	1,994,958	2,443,998	8,541,726
July...	22,090,187	6,406,184	4,493,516	1,912,668	8,627,400	7,056,603
August	20,620,811	6,323,475	4,754,701	1,568,774	7,840,353	6,456,977
September	19,097,803	5,544,686	3,975,917	1,568,769	7,462,113	6,091,004
1932—Jan....	$15,894,506					
Feb....	16,270,822					
March.	19,089,005		Comparative data not available			
April..	22,612,193					
May...	24,981,441					
June ..	19,637,358	4,685,399	3,617,719	1,067,680	8,734,330	6,217,629
July...	14,430,122	3,793,245	2,900,707	892,538	6,058,813	4,578,064
Aug....	16,032,441	3,851,028	3,057,096	793,932	6,918,659	5,262,754
Sept...	16,805,712	3,980,564	3,113,303	867,261	7,216,748	5,608,400
Oct....	15,592,377	3,996,500	3,036,323	960,177	6,610,011	4,985,866
Nov....	12,492,818	3,599,319	2,639,362	959,957	5,196,766	3,696,733
Dec....	9,484,520	3,222,770	2,186,706	1,036,064	3,506,715	2,755,035
Totals, yr..	$203,323,315					
1931—Total..	278,442,170					

*See page 402 for article by Dr. Barsky.

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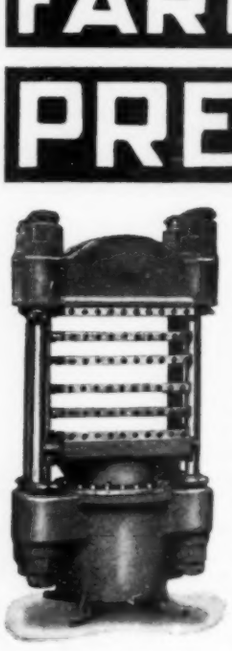

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Coatings

Trigg In Washington

Most important paint convention in the industry's history is the way those present at the recent Chicago meeting at the Edgewater Hotel briefly summarize its happenings. Most important, of course, was the amalgamation of the 2 national paint groups into a new, broader, more comprehensive body, the National Paint, Varnish and Lacquer Association. No astute theatrical showman could have picked a more dramatic moment to announce actual signing of the industry NRA code, but the fact that such announcement did take place on the convention floor was but a happy coincidence.

President Roosevelt's pen brought to a close a period of feverish preparation and hard work on the part of Chairman Trigg's Code Committee, but it merely started the Committee's chairman off on a still more arduous journey—a journey of 3-years—an exile of 3 years in Washington, separated from his business—as head of the newly formed national association.

Mr. Trigg, president, John Lucas & Co., Philadelphia, was the overwhelming choice of the 500 or more men gathered at Chicago. He has been an outstanding figure of the paint and allied fields for many years. A few of his association offices have been: president of the Paint Manufacturers' Association (1911); president, Philadelphia Paint, Oil & Varnish Association (1918-1921); N. P. O. & V. Association head (1922).

Vice-president of the newly formed body is H. A. Melum, vice-president, Benjamin Moore & Co. Lacquer is represented in the new association by J. Heath Wood, Standard Varnish; O. J. S. de Brun, Egyptian Lacquer; W. S. Dabney, Jones-Dabney. The executive committee of the National, Paint, Varnish and Lacquer Association will meet quarterly.

Du Pont Wins

U. S. Circuit Court of Appeals for the 2nd District, after a rehearing on the so-called Flaherty lacquer patents suit of du Pont against Glidden, unanimously sustained its former decision upholding the validity of the patents.*

This latest decision, rendered Nov. 13, was on a petition filed by Glidden for a rehearing of the case which was decided against it by the Circuit Court of Appeals last July. At that time, the Circuit Court reversed a decision of the U. S. District Court for the Eastern District of N. Y., in which the case had 1st been heard when the du Pont company brought suit for infringement.

It is quite probable that Glidden will now move to bring the case into the U. S. Supreme Court in a final effort to reverse the decision of the Circuit Court of Appeals.

*See page 407 for abstracts from both briefs.

COMING EVENTS

Exposition of Chemical Industries, Grand Central Palace, N. Y. City, Dec. 4-9.

American Institute of Chemical Engineers, Roanoke, Va., Dec. 12, 13, 14.

American Management Association, 4th Annual Packaging Exposition, Hotel Astor, N.Y. City, March 13-17, 1934.

American Chemical Society, St. Petersburg, Fla., week of March 25, 1934.

New Offices

Mearl Corp., manufacturers of Pearl Essence, have opened N. Y. City office and laboratory at 127 W. 20 st. Laboratory will be in charge of Chemical Director H. E. Mattin. Factory has been removed to Roselle Park, N. J.

Honored Guests

Ernest T. Trigg, John Lucas Co. head, and now in Washington as president of the newly formed National Paint, Varnish and Lacquer Association, was honored at a dinner by members of the Philadelphia Paint, Oil and Varnish Club on Nov. 20. Mr. Trigg at 1 time was president of the club.

Sherwin-Williams' general production manager, C. S. Neal, was honored at a dinner Nov. 6. He has completed 25 years with S.-W. In 1908 he went with Acme White Lead and finally rose to general production manager. In '20 when S.-W. acquired Acme he became general superintendent of all paint and varnish plants.

Paint Prices Rise

Finished paint prices finally caught up with higher raw material costs under NRA. Du Pont announced higher prices Nov. 23, and Devoe & Raynolds notified trade on the same date that early in December it will advance prices about 7½%. This follows an increase in prices last June of about 5% and makes total advance this year between 12-13%. It is expected that advances will also be made in lacquers.

Devoe & Raynolds Co. declared Nov. 23 extra dividends of 25c each on Class A and B common stock, and placed both classes on a $1 annual basis by declaration of quarterly dividends of 25c each on both issues. Company also declared regular quarterly dividends of $1.75 each on 1st and 2nd preferred stocks. All dividends are payable Jan. 2 to stock of record Dec. 20. These are the 1st payments on the common since April 1, 1932, when the stock received 15c quarterly.

New Construction

Paramet Chemical, Long Island City, is constructing 2 story building devoted to laboratory and research work in connection with the manufacture and development of synthetic resins. Factory offices are also being renovated.

Personal

A. C. Horn discussed "Profits In Industrial Sales" at the recent convention. O. J. S. de Brun, Egyptian Lacquer spoke on "Cost of Development and Servicing and Their Abuses."

Du Pont's Edward F. Maloney, who directed the 2nd Paint Industries' Show, will have charge of the 1934 one also.

Beck, Kollers' president, Henry Reichhold, made the journey to Germany in the Graf, the industry's 1st air passenger to Europe. He will be present at the opening of the company's new plant in Liverpool.

Cellulose Plastic Products

(Nitro-Cellulose and Cellulose Acetate Sheets, Rods, and Tubes)

September, 1933

Compared with preceding months

The Bureau of the Census presents, in the following table, monthly statistics on production and shipments of cellulose plastic products (sheets, rods, and tubes), based on data furnished by 8 identical establishments from January to July, inclusive, and by 10 establishments for August and September. Comparable statistics, prior to January, 1933, segregated for nitro-cellulose and cellulose-acetate products, are not available.

This report takes the place of the monthly report on "Pyroxylin Sheets, Rods, and Tubes."

Production and Shipments (Pounds)

Year and Month 1933	*Nitro-Cellulose*						*Cellulose-Acetate*	
	Sheets		*Rods*		*Tubes*		*Sheets, Rods, and Tubes*	
	Production	*Shipments*	*Production*	*Shipments*	*Production*	*Shipments*	*Production*	*Shipments*
January	504,813	625,392	74,872	115,434	12,812	29,329	167,856	160,272
February	490,290	593,942	78,904	100,092	16,248	25,711	141,628	125,073
March	454,506	611,840	63,188	87,784	17,472	32,525	119,400	117,344
April	473,333	624,727	104,817	130,853	26,198	27,091	149,402	211,435
May	787,614	774,424	161,784	126,195	32,684	36,992	234,811	221,345
June	912,742	959,194	156,830	139,772	41,467	45,057	242,013	220,686
July	1,027,812	916,612	158,250	160,851	42,100	41,467	192,381	221,751
August	1,290,521	1,257,981	254,249	236,730	40,364	56,142	230,013	231,879
September	1,307,052	1,158,080	241,558	232,725	49,263	58,962	213,996	229,629

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	1931 September	1932 September	1933 August	1933 September
LIGHT GOODS:				
Shipments—				
Linear yards	1,251,329	1,298,384	2,178,858	1,408,728
Value	$331,508	$259,896	$537,841	$365,422
Unfilled orders (b)—				
Linear yards	857,195	811,811	1,032,913	987,025
HEAVY GOODS:				
Shipments—				
Linear yards	1,167,339	1,111,557	1,709,846	1,309,763
Value	$659,481	$483,544	$814,865	$665,013
Unfilled orders (b)—				
Linear yards	1,543,288	1,183,712	1,718,179	1,672,548
PYROXYLIN SPREAD (c):				
Pounds	2,822,276	2,403,332	3,690,884	2,760,809

(a) Of the 19 establishments reporting for September, 1933, 3 establishments did not report prior to January, 1933.

(b) Orders on hand at the close of the current month (reported in yards only) exclusive of contracts with shipping dates unspecified.

(c) Based on 1 lb. of gun cotton to 7 lbs. of solvent, making an 8-lb. jelly.

Du Pont's new refrigerator finish "Dulux" is said to be meeting with immediate success. It has no tendency to chip, crack or flake. It resists even hammer blows and the staining effects of household oils, greases and acids.

Hercules' New Resin

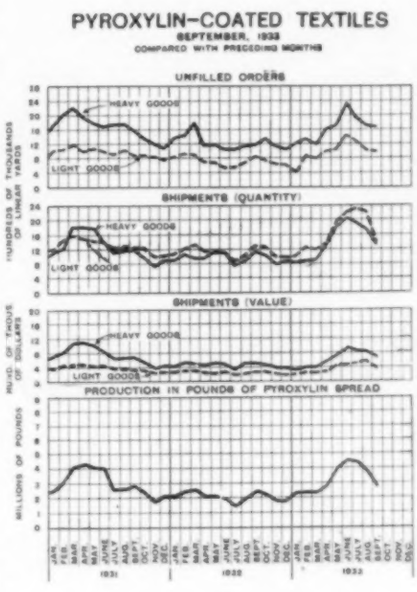
Vinsol, new Hercules Fowder resin, was announced Nov. 8 by officials of the naval stores dept. Known as Vinsol Resin No. 1, new product is a hard, black, tough, nontacky, oil-resistant resin for use in insulating varnishes, impregnating compositions, lacquers, emulsion paints, and thermoplastics, especially as a raw material for thermoplastics of the phenol-formaldehyde type.

Characteristics of the new material differ widely from other resinous compounds in that it is insoluble in drying oils and most varnish thinners, is soluble, however, in lacquer solvents, is harder and tougher than rosin and is not tacky at normal temperatures. It may be plasticized with castor oil without appreciable effect on its insolubility in petroleum oils.

Vinsol has good dielectric properties, according to Hercules authorities, and will be useful in many types of insulation and sealing compounds.

Cellulose

Table above presents monthly statistics relating to pyroxylin-coated textile based on data reported to the Bureau of the Census by 19 (a) identical establishments comprising most of the industry. Data given include products manufactured by spreading nitrocellulose or pyroxylin preparations, either by themselves or in combination with other materials, upon grey goods, such as sheetings, drills, ducks, sateens, moleskins, etc. Monthly capacity of the 19 establishments, amounting to 12,027,689 yds., in September, is based on a maximum quantity of 1.27 to 1.30 sateen, coated to a finished weight of 17½ oz. per linear yard, in a 24-hour working day, 26 days to a month.



Du Pont's Boardwalk Display

A complete line of evening handbags made of Du Pont Pyralin by Esco Novelty, Inc., N. Y. City, formed an interesting display recently at the Du Pont Exhibit on the Boardwalk at Atlantic City. Bags, which were in keeping with the trend for shiny accents in accessories, featured the ever-popular black, ivory and combinations of the 2 in a variety of styles, including rhinestone trims. Among the models on display were several unusual shapes in envelope and flat pouch styling, with metal frames and faille or satin linings matching the bag in color. The rhinestone trims were carried out in restrained design on the bag front and in some numbers on a matching bracelet ring handle. All the bags were equipped with inside pocket, mirror and coin purse.

One of the Boardwalk windows at the Du Pont Exhibit in Atlantic City was devoted last month to a display of fountain pen and pencil sets, desk sets, mechanical bridge pencils, as well as the Eagle Mikado lead pencil. Pyralin is used in making the fountain pen and pencil sets, desk sets and mechanical pencils, while Du Pont finishes are used on the lead pencils. These products are manufactured by the Eagle Pencil Co., N. Y. City.

Uses for Cellophane

Fredberg Bros., N. Y. City, are marketing Cellophane ribbon imprinted with NRA emblem and slogan "We Do Our Part." A 'Cadia Powder Puff Co., N. Y. City, is marketing new powder puff unit in individual Cellophane envelopes. A. A. Arbetter is distributing Cellophane ribbon in 12 colors and tints and in widths of 3/16 to 1 inch.

Simple Test

Identification of cellulose derivatives may be accomplished, according to "Solvent News"—novel advertising insert of United States Industrial Alcohol Co. appearing in a number of trade papers, by dyeing with an aqueous solution of iodine. Upon being treated with the solution and thoroughly washed, they acquire the following characteristic colors: nitrocellulose, yellow; acetylcellulose, straw yellow; nitroacetate, deep yellow; butyrate cellulose, deep maroon; ethylcellulose, very deep red brown; benzyl-cellulose, brown.

Worth Reading

Industrial & Engineering Chemistry (American Chemical Society) for November contains "Laminated Safety Glass" by George B. Watkins, Libby-Owens-Ford Glass, and William D. Harkins, University of Chicago, an interesting review of the industry. Same issue contains "Cellulose Acetate Plastic Improves Laminated Safety Glass" by George B. Watkins and Joseph D. Ryan, also of Libby-Owens-Ford. Particular issue also contains "Plant Equipment From Synthetic Resins" (the new German Haveg material) by D. H. Killeffer.

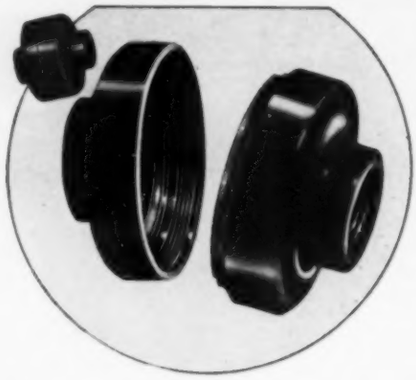
Laminated

Formica Insulation reports for quarter ended Sept. 30, 1933, net profit of $26,253 after taxes and charges, equivalent to 14c a share on 180,000 no-par shares of capital stock. This compares with net loss of $6,129 in September quarter of 1932.

For 9 months ended Sept. 30, last, net loss was $7,272 after taxes and charges, against net loss of $20,411 in like period of 1932. Net sales for the 9 months totaled $902,320, against $1,171,404 in first 9 months of previous year.

Current assets as of Sept. 30, 1933, amounted to $602,280 and current liabilities were $58,674, comparing with $588,906 and $35,150, respectively, on Sept. 30, a year ago.

Blossom Mfg., N. Y. City, has been appointed agent for G. E.'s lightweight oiled silk which is to be marketed for curtain showers, raincoats, umbrellas, etc.



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New Booklets

No. 7. E. I. du Pont de Nemours, Wilmington. The Du Pont Magazine for November contains several interesting items to the Cellophane user, describes Pyralin and Plaascele as protective materials, and generally speaking is even more than usually so, a "plastics issue."

No. 8. Hercules Powder Co., Wilmington. Hercules Mixer for October is a real "Wild West" number.

No. 9. General Plastics, North Tonawanda, N. Y. This primer illustrates and explains 7 different applications for phenolic resin materials:—laminating varnishes, resin-impregnated paper, paint and varnish resins, plywood-bonding resins, insulating varnishes and resins for casting cores, in addition to molding compounds. Each use or industrial application is concisely described.

No. 10. General Electric, Plastics Dept., West Lynn, Mass. A new price list, profusely illustrated, and complete engineering data on Textolite laminated, Textolite molded, etc. Catalog numbered GEA-937C supersedes GEA-937B.

No. 11. Bakelite Corp., 247 Park ave., N. Y. City. Bakelite Review for October tells the story of Bakelite's new colorful resinoid—"the material of a 1,000 uses."

No. 12. Mishawaka Industrial Instrument Mfg. Laboratory, 936 Washington ave., Mishawaka, Ind. Two new booklets describe and illustrate a new line of indicating pyrometers.

No. 13. Binney & Smith, Inc., 41 E. 42 st., N. Y. City. The Black Art of Rubber Compounding (Chart No. 23), covers briefly technical history of standard Micronex and also discusses quality of old stocks of carbon black on hand. It also describes briefly present-day application of Micronex, Micronex W-5 for wire insulation, Dustless Micronex and Fumonex.

No. 14. Hercules Powder. The Virginia Cellulose Dept., has issued a 30-page brochure "Hercules Chemical Cotton: Best Source of Cellulose." It describes manufacture and use of chemical cotton and its wide industrial application in synthetic fibres and as a basic material in nitrocellulose and cellulose acetate. Book is also printed in German and French.

No. 15. Monsanto Chemical Co., St. Louis. The 13th edition of the list of Monsanto chemicals arranged alphabetically includes several new products. Such a list is invaluable to the purchasing agent.

No. 16. R. & H. Chemicals Dept., E. I. du Pont de Nemours & Co., Wilmington. Quarterly price list shows several important price revisions.

No. 17. The Baker Castor Oil Co. Morgan & Washington sts., Jersey City. Reprint of recent advertising listing new alkyl ricinoleates-revolutionary products now finding wide variety of uses as plasticizers, dispersing and grinding media, emulsifiers, detergents and "wetting out" agents. Baker's "P" Line of alkyl rincinoleates consists of 16 new chemicals each with separate and novel physical and chemical properties that make their investigation by chemists imperative.

No. 18. The Brown Instrument Co., Philadelphia. Catalog No. 6702 is a new 80 page booklet, profusely illustrated, describing in great detail the new Brown Thermometer and Pressure Gauge line. (For more complete description see the New Equipment section, page 432.

No. 19. Cushman Chuck Co., Hartford, Conn. A new 12 page booklet describing the new Cushmatic "Pull-Push" Power Units electrically operated. (Bul. 127).

No. 20. The Patterson Foundry & Machine Co., East Liverpool, Ohio. Company has just released 2 booklets; (1) descriptive literature on the new Patterson Unipower Agitator; (2) the Patterson High Tensity Magnetic Separator.

No. 21. Charles Ross & Son, 148-156 Classon ave., Brooklyn. Catalog No. 8C describes roller mills for printing ink, paints, lacquers, coatings, etc.

No. 22. The Haveg Corporation, Newark, Del. This is the 2nd booklet gotten out by the Haveg Corp., (American manufacturer of a protective material made from asbestos and a resin of the phenol-formaldehyde type 1st developed in Germany) and it is more complete and specific than its predecessor. Contains complete data on the chemical resistance to a large number of acids, bases and solvents; contains a large number of illustrations showing chemical operating equipment of various sizes and shapes protected with Haveg; describes fittings, screens, filter press plates and frames protected; describes "Havegit" cold setting acid proof cement. Every operating official will find the booklet instructive.

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Molded

Colt Declares Extra

Earnings received this year by Colt's Patent Fire Arms Mfg. Co. on business contracted and produced in former years but not received until this year will be distributed to stockholders in the form of an extra dividend of 25c a share and to employees in the form of cash distribution amounting to 2% on their salaries or wages for this year.

At the meeting of the board of directors they declared the regular quarterly dividend of 25c a share payable on company's 200,000 shares and a special dividend of 25c a share Dividends will not be paid on treasury stock. These dividends will be payable Dec. 30 to stockholders of record Dec. 2. Special dividend makes payments to stockholders this year amount to $1.25 a share.

Resolution adopted in connection with the payment for employees follows: "Voted: That as of Dec. 31, 1933, there shall be paid to each of the then employees who were in the employ of the company on July 1, 1933, a special payment equal to 2% of the total amount of salary or wage paid to each of said employees during the year 1933.

"This special payment to be paid from earnings received this year on unusual business contracted and produced several years ago but for which payment was not finally received this year."

Employees will benefit to the amount of approximately $35,000, according to estimates.

Standard Pulverizing, N. Y. City, has a new soap dispenser (molded of Bakelite) which pulverizes solid bar soap as needed.

T. Smith Taylor Laboratories, 45 Grover Lane, Caldwell, N. J., T. Smith Taylor, director, (formerly with Bakelite and well known in the plastics field), has issued a booklet describing in detail the services offered to the industry.

November *Durez Folder* features an article on the subject of proprietary products.

James McIntosh of Mack Molding, Wayne, N. J., has joined the Purchasing Agents' Association of N. Y.

George Switzer, designer, has been appointed design counsel to Murray and Flood, New York consultants to management, among whose clients are leading industrial and utility companies.

American Society for Testing Materials has appointed H. C. Mougey, assistant technical director and chief chemist, Research Laboratories, General Motors Corp., as the A.S.T.M. representative on the Sectional Committee on Specifications and Methods of Test for Safety Glass.

One research "gang" visits another. Bakelite officials on the steps of Hercules' Experiment Station—Main Laboratory. Left to right: A. L. Langmeier, Director of sales, Hercules naval stores dept.; O. A. Pickett, acting director, Hercules' Experiment Station; George W. Backeland, vice-president, Bakelite; Dr. L. V. Redman, vice-president and director of research, Bakelite; Dr. E. R. Hanson, Bakelite; L. N. Bent, Hercules' naval stores dept.; J. M. Bell, Hercules; D. R. Wiggam, ass't. director, Hercules' Experiment Station, and Theodore Marvin, advertising manager, Hercules.

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Plastic Patents

Machinery

Improved hot platen for presses, with method for closing cross passages of steam platens. No. 1,928,443. H. G. Archer and C. G. Bird, to Baldwin-Southwark Corp., Philadelphia.

Phenols

Recovery of phenols from liquors by removing impurities and using alkaline reagent to remove the phenols. No. 1,927,883. W. B. Wingert, to Semet-Solvay Co., New York.

High sulfur content plastic comprising ethylene and a sulfurized phenol plastic. No. 1,927,929. Carleton Ellis, Montclair, N. J.

Process for the manufacture of non-dyeing sulfurized phenol derivatives. No. 1,928,257. H. Leeman & V. Kartaschoff, to Firm Chemical Works, Sandoz, Basel, Switzerland.

Oil-modified resins of phenol-formaldehyde type, and resulting varnish, using aqueous solution of formaldehyde and tung castor oils. No. 1,928,739. N. Strafford, England, to Imperial Chemical Industries, Ltd.

Process for forming a diphenylol naphthene, 2 parts phenol, 1 part cyclic ketone in presence of acid catalyst. No. 1,929,209. W. H. Moss, to Celanese Corp.

Process of extracting phenols and substantially water insoluble ingredients of ring structure from oils containing same. No. 1,929,438. Ralph H. McKee, Jersey City.

Purifying or decolorizing organic acids, using phenolic and hydrocarbon solvents. No. 1,930,054. A. O. Jaeger and L. C. Daniels, to The Selden Co., Pittsburgh.

Insulating compound, of the thermoplastic and electrical properties required for deepsea cables; 40% rubber, 40% balata or gutta percha, small amount of diphenyl-ethylene-diamine. No. 1,930,274. A. R. Kemp and J. H. Ingmanson, to The Bell Telephone Laboratories, New York.

Addition of inorganic base before distillation as step in refining of crude phenols. No. 1,931,057. E. Clemmenson and R. M. Miller, to Monsanto Chemical Co.

Manufacture of phenyl esters of phosphoric acid; the step of treating the crude ester with a water soluble permanganate. No. 1,931,056 and 1,931,058. E. Clemmenson, to Monsanto Chemical Co., St. Louis, Mo.

Heat with alkali metal salts, for derivatives from sulfurized phenol. No. 1,931,197. V. Kartaschoff, to Sandoz Chemical Works, Basel.

Urea

Formulae for urethane derivatives and process for their production. No. 1,927,858. H. Ulrich and P. Koerding to I. G. F. Frankfort.

Miscellaneous

Plastic containing methylene sulfide and a sulfur-containing resin. No. 1,927,930. Carleton Ellis, Montclair, N. J.

Process for simultaneous production of ethylene glycol and acetaldehyde by condensation of pressure vapors. No. 1,928,240. P. Askenasy and A. Heller, Karlsruhe, Germany.

Use of inorganic ammonium salt for high yield of acetone and butyl alcohol and low yield of ethyl alcohol, in manioc mash fermentation. No. 1,928,379. H. B. Hutchinson, to The Distillers Co., Edinburgh.

Sulfonated condensation products of aromatic compounds, with carbonyl radicle from group of furance aldehydes and their amides. No. k,928,647-8. Ellis, Olpin and Kirk, Spondon, England to Celanese Corp. of America.

Laminated structure of flake mica, using as binder a polyhydric acid-polybasic acid reaction product, a plasticizer, and adhesive agent. No. 1,928,713. H. C. P. Weber, to Westinghouse Co.

For materials having surface elements soluble in organic solvent, to be joined to similar materials. Adhesive made up of gum thus, glyptal resin, acetone, ethyl acetate, castor oil and gelatine and casein solutions. No. 1,929,013. W. H. Church and J. E. Snyder, to duPont Cellophane Co., N. Y.

Electric outlet molding. No. 1,929,547. P. J. Cassidy to A. P. Dorsey, Poughkeepsie.

Duplicating rolls, both sides coated by lacquer with binding agent of solvents for both lacquer and duplicating composition on one lacquer coating, the composition applied to the binding agent. No. 1,929,601. Carl S. Miner, to C. H. Joy, Jr., Chicago.

Obtaining carbon black and a hydrogen-nitrogen gas mixture, in controlled proportions, using thermal dissociation of gasses and vapors. No. 1,929,664. W. D. Wilcox, Lawrence, Kansas.

Process for producing hexamethylenetetramine from methane, nitrogen and oxygen. No. 1,930,210. Paul Nashan, Rhineland to Gutehofnungshutte, Oberhausen, Germany.

Home recording disk and its stylus, a laminated record-tablet with core and resilient surface layers. No. 1,930,502. F. C. Barton, to Radio Corp.

Rubber to adhere to a rigid material by interposing a layer of vulcanizable rubber combined with fusible synthetic resin, to harden and become infusible when heated. No. 1,931,309. O. A. Thompson, Cuyahoga Falls, to B. F. Goodrich Co., New York.

Cellulose

Fluid printing ink for cellulose plastics, of twice as much dimethyl phthalate as of cellulose nitrate, with from three-quarters to twice as much pigment. No. 1,931,485. A. F. Caprio & Wm. Bowker to Celluloid Corp.

Glass substitute, material covered with transparent cellulosic film permeable to ultra-violet light. No. 1,931,518. James F. Walsh to Celluloid Corp.

Method of manufacturing cellulose of high alpha content and quality. No. 1,931,575. J. J. de la Roza, Tuinucu, Cuba.

Process for increasing solubility of certain cellulose esters. No. 1,931,844. M. Hagedorn & G. Hingst, to I. G. F., Frankfort.

The manufacture of 95% alpha cellulose pulp. No. 1,931,933. W. D. Nicoll to E. I. DuPont & Co.

Use of excess caustic soda in preparation of cellulose xanthate from fiber. No. 1,932,751. Gel. A. Richter, to Brown Co., Me.

Molding composition of hydrolyzed ligno-cellulose, furfural and a mineral acid. No. 1,932,255. E. C. Sherrard & E. Beglinger, Madison, Wis., to the Government and People of the U. S.

Use of chlorine gas and air on alkali-treated fiber, in pulp process. No. 1,932,904. Ralph H. McKee, N. Y. City.

De-nitrating spun nitro-cellulose products by ammonium sulfide and hydroxide. No. 1,933,204. Harry P. Bassett, Kentucky.

Alcohol method of recovering plasticizers from Celluloid and like plastic compositions. No. 1,933,205. Harry P. Bassett, Kentucky.

Treatment of refined pulp with lactic acid, to prepare cellulose acetate. No. 1,933,676. J. W. McKinney, to Brown Co., Berlin, N. H.

The separation of objectionable elements from organic esters of cellulose. No. 1,933,720. C. Dreyfus & G. Schneider, to Celanese Corp.

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Cellulose organic ester containing benzyl ether of a hydroxybenzene. No. 1,933,794. L. W. Eberlin & J. J. Schmitt, to Eastman Kodak Co.

Decorations, by producing color changes in cellulose ester plastic material. No. 1,933,810. W. J. Kenyon & C. J. Staud, to Eastman Kodak Co.

Process for producing mixed cellulose esters. No. 1,933,815. C. J. Malm & C. E. Waring, to Eastman Kodak Co.

Cellulose acetates containing p-biphenyl benzoate. No. 1,933,822. T. F. Murray & C. J. Staud, to Eastman Kodak Co.

Complex cellulose organic ester composition. No. 1,933,826. Henry B. Smith, to Eastman Kodak Co.

Cellulose ester containing ethyl gamma-phenoxy butyrate. No. 1,933,827. Henry B. Smith, to Eastman Kodak Co.

Process for mixed cellulose nitroacetate higher fatty acid esters. No. 1,933,828. C. J. Staud & C. E. Waring, to Eastman Kodak Co.

The preparation of cellulose acylnitrate. No. 1,933,829. C. J. Staud & J. T. Fuess, to Eastman Kodak Co.

Manufacture of decorated casings for fountain pens and the like, integrated by heat-shrinkage. No. 1,934,047. E. G. Desnoyers & H. E. Nime, to The Fiberloid Corp., Indian Orchard, Mass.

Cellulose acetate, powdered, anti-dusting, retaining electrostatic charges. No. 1,934,450. S. E. Sheppard & L. W. Eberlin, to Eastman Kodak Co.

Cellulose fiber of low solution viscosity, and process. No. 1,935,129. George A. Richter, to Brown Co., Berlin, N. H.

Cellulose fiber mass incorporating colloidal complex for preservative. No. 1,935,196. E. C. Lathrop & F. A. Irvine, to The Celotex Co., Chicago.

Two-step process of fiber liberation; and treatment of cellulose fiber. Nos. 1,935,579-80. George A. Richter, to Brown Co., Berlin, N. H.

Coatings

Resinifying and oxidizing distilled castor oil, with agents, for a coating for metals. No. 1,932,156. A. J. Ducamp & M. E. A. Baule, Paris, France.

Cellulose compound film, sulfur-treated, as protective covering. No. 1,932,617. J. C. Ford & E. Olsen, Madison, Wis.

Indurable artificial resins, tar-oil, and anthracene in process for metallic protective coating. No. 1,932,699. H. Klass, to stallwerke. Akt., Dusseldorf, Germany.

Auto-oxidizable varnish of metal salt from alkylated phenol monocarboxylic acid derivative. No. 1,933,520. H. A. Bruson, to Resinous Products & Chemical Co., Philadelphia.

Use of tenacious gum hydrocarbons, free from resins, for impregnating wood and other fibrous substances. No. 1,933,573. F. F. von Wilmowsky, N. Y. City.

Castor oil-polybasic organic acid coating compositions. No. 1,933,697. H. J. Barrett, to E. I. DuPont & Co., Wilmington, Del.

Raw Chinawood oil-fusible rosin as base for wrinkle finish varnish. No. 1,934,034. G. H. Burgman, to G. J. Liebich Co., Chicago.

Castor-oil condensation product base for pyroxylin coating composition, with ester gum or copal hardening agent. No. 1,934,261. Charles T. Ellis, to Sherwin-Williams Co., Cleveland.

Artificial leather of fabric, coated by polyhydric alcohol-polybasic acid resin and baked. No. 1,934,709. A. J. Hemmer, to E. I. DuPont & Co., Wilmington, Del.

Tire cover, outside coated by cellulose nitrate film and inside by casein-glycerine film. No. 1,934,711. D. G. Higgins, to E. I. DuPont & Co., Wilmington, Del.

Laminated

Apparatus for use in manufacture of laminated glass. No. 1,933,639. C. B. Schaefer, to Libbey-Owens-Ford, Toledo.

Method for making composite glass, with means of fluid supply under pressure. No. 1,934,772. J. H. Sherts, to Duplate Corp., Del.

Miscellaneous

Gutta percha of low resin content with diluent of semi-solid petroleum product, as electrical insulating material. No. 1,934,335. W. S. Smith, H. J. Garnett & J. N. Dean, Orpington, England.

Plastic composition brake lining with refractory friction material strip, hardened. No. 1,932,919. H. Abert & A. Whitelaw, to Raybestos-Manhattan, Passaic, N. J.

Fibrous material hood cap for bottles, with plastic binder composition carrying sulfur. No. 1,933,466. W. L. Wright, to Oswego Falls Corp., Fulton, N. Y.

Glass substitute; elliptical wire base coated with flexible cellulose derivative composition to fill meshes. F. A. Canon, to Acetol Products, Inc., N. Y. City.

Process for making plates, section pieces etc., from phenol-formaldehyde resins. No. 1,934,817. K. Raschig & M. Koebner, to Dr. F. Raschig G.m.b.H., Germany.

Hard, inflexible plate of plastic synthetic resin with abraded material in grooves, as razor blade sharpener. No. 1,934,139. E. G. Pavitt, to Newton Sales Co., Ltd., London, England.

Molding

Removal of phenolic moldings from ridged or recessed cores of mold, while still hot and elastic. Re-issue No. 19,000, (original 1,916,962). George K. Scribner, to Boonton Molding Co., Boonton, N. J.

Phenol

Process of preparing acylated phenols. No. 1,933,975. H. L. J. Haller & P. S. Schaffer, Washington, D. C., to the free use of the Public.

Process for de-phenolizing liquid hydrocarbons by formic acid. No. 1,934,007. Hans Roos & E. Schwamberger, to I. G. F., Frankfort.

The removal of phenols in a pure state from tars or tar-oils. No. 1,934,861. J. Karpati & M. G. Hubsch, Budapest, Hungary.

Resins

Process of conversion of agent chosen from certain fatty oils with acid reagents from such oils, and after polyhydric alcohol-polybasic acid reactions forming a synthetic resin. No. 1,932,688. M. M. Brubaker, Wilmington, to E. I. duPont & Co., Wilmington, Del.

Process and products of aromatic ester of aliphatic acid with a reactive methylene-containing agent, and of phenyl carbonate with the same agent. No. 1,933,124. Fritz Seebach, to Bakelite Gess., Berlin, Germany.

Hydrocarbon distillates under solvent, the unsaturated hydrocarbons reacted with furfural to manufacture synthetic resins. No. 1,933,715. Roland B. Day, to Universal Oil Products Co., Chicago.

Hydrocarbon distillates of the same sort and similarly reacted with an oxidizing gas and finally with an aldehyde to manufacture synthetic resins. No. 1,933,716. Roland B. Day, to Universal Oil Products Co., Chicago.

Resinous condensation product of a phenol and a ketonic, monobasic acid, said product free of esterified phenol. No. 1,934,032. H. A. Bruson, to Resinous Products & Chemical Co., Philadelphia.

Molding mixture of hexamethylenetetramine-triphenol type resin, water-repellant organic substance, and a filling material. No. 1,931,958, application August 1926. Frazier Groff, to Bakelite Corp., N. Y.

Urea

Moldable composition from urea and aldehyde, with method for solvent evaporation. No. 1,935,411, application September 1927. F. Pollak & W. Kraus, Vienna, to Synthetic Plastics Co., Inc., N. Y. City.

We SPECIALIZE in

Experimental and Limited Production

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Having our own Design and Mold Construction Departments, in addition to a modern press room, we are able to give complete service. If you have an idea for a molded product, let us assist you in its development. Our methods insure inexpensive sample molds and satisfactory moldings.

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From 25 to 100 Mesh

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●

AVAILABLE: A chemist with a good knowledge of the manufacture of compositions for cold molding seeks a connection with a small well equipped organization specializing in molded products only. Well experienced. Reasonable. Address Plastic Products, Box 617.

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SALES EXPERT: 5 years' experience with A-1 concern. Married. Only company contract with good firm considered. Established territory. Salary and expenses only arrangement. Will travel. Box 616, PLASTICS PRODUCTS.

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FOR SALE: 1 Southwark High-Low Pumping Unit in excellent operating condition, low capacity of 215 pounds with from 50 to 75 gallons per minute, and a maximum capacity of 2,500 lbs. sufficient to operate 8 presses. 1—Zeh & Hahnemann Percussion Power Press with several dies for various size tablets. Both these items can be inspected in operation. Reply to Box 616, PLASTIC PRODUCTS.

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West Coast Representative is desired by a large eastern plastic molding concern. Address your inquiries to Box 618 Plastic Products.

FOR IMMEDIATE SALE

(1) 1 set 16" x 36" mixing rolls with 150 HP. G. E. motor and compensator and link belt drive. (2) 9 hydraulic presses, Watson Stillman type platens 13" x 18", 2½" ram, 3½" stroke. (3) 5 William Thropp hydraulic presses, platen 15" x 15", 8" ram, 5" stroke. (4) 34 Standard type toggle presses, platens 13¼" x 14¼". (5) 18 steam tables 24" x 42", 15 steam tables 18" x 30". (6) 1-50 ton Terkelson press; 2-100 ton Terkelson press (Satest type). (7) 1 Meade Grinder. (8) 1 Jeffrey Grinder. (9) 1 Southwark High pressure Vertical Triplex Pump with 5 H. P. integral motor drive.

THE WATERBURY BUTTON COMPANY
Waterbury, Connecticut.

And Now, in Closing:—

Once again we have been afforded the dubious pleasure of being mistaken for something else. A recent communication from a large eastern railroad supply house has asked us to quote on 2,000 pounds of Steel Sash Putty (green) in 100 pound cans. Unfortunately, we have just closed out our stock on this item. In a way, of course, this is an interesting commentary on the modern buyer. Every publication receives many similar requests, showing that the 'phone book is still the inaccurate buyer's guide it has always been.

Well, Com. Litvinoff *did* "leave his whiskers home" and we recognized Russia! It is interesting to recall, perhaps, the volume of business with Russia during the past few years. It will be instructive to compare them with figures for subsequent years.

In 1932, for example, we exported $16, 307,000 to the Soviet; in 1931, $118,406, 000; in 1930, $136,162,000. In two of these years, German exports exceeded our own, while Great Britain exported around $40,000,000 annually.

However, in those three years the Soviet Union sold to Great Britain $224,462,000 more than it bought in return, while it purchased in Germany and the United States $514,038,000 more than it sold! While these figures are not conclusive, they do indicate that diplomatic and trade relations with Russia will open an even wider market for this country, increasing Great Britain's status as a creditor.

We respectfully refer Messers Warren *et al* to the possibility of using a Plastic Dollar!

Dr. George Barsky, whose address at the November round table of the American Institute is presented in this issue, is at present conducting his own research and consulting offices. For many years he was Director of the Experimental Laboratory of American Cyanamid, a graduate of Columbia with a long list of degrees—B. S. Ch. E., M. A., Ph.D.—he talks much as he writes, concisely and with deliberation for the chemical aspects of his subjects. Very few men have such an intimate understanding of plastic technology.

The rather lengthy summary of the duPont—Glidden case is presented because we believe most coatings and raw material firms, as well as many consumers, are highly interested. It does not, of course, provide piquant fare for the molder or processor. We know that these last will bear with us, however, while we talk to the other group of readers.

At the recent Eastern Homeopathic Medical Association meeting in New York, Dr. K. W. Ney of the Flower Hospital proceeded, calmly, to saw off the top of a man's skull. He replaced it (fortunately) with a six-ply piece of pyroxylin. After operating, he stated that the patient would be normal except for a slightly flattened head.

(*Plastic Products' Skulldudgery Editor strongly advises the unknown patient to avoid argument and personal discussions. It is unwise for a pyroxylin skull to get too hot-headed*).

Remember Rommel's book "Farm Products in Industry," bound in and printed on stock made from cornstalks? We at last have its companion volume. Published in England, it is a book on "The World of Tomorrow"—cover of cellulose acetate plastic with full page illustrations printed on transparent cellulose paper. The author, J. O. Evans, has paid much attention to the role of plastics for the future.

Franklin Brill of General Plastics has shown his individual thoughts in many an article in our pages. It is not difficult to believe, therefore, that he is the Franklin Brill who is described in the November "World's Work" as the builder of a modern home in Buffalo which "has no cellar, dining room, furnace, baseboards, flooring, tiling, eave-troughs, closet doors or bedsteads." It does have, however, a "built-in radio!"

Having slipped past our eighth birthday two months ago in comparative quiet, we feel we may be pardoned a public back-patting by subscriber Bedford Davies. He writes: "I am both pleased and interested in the improvements shown in your publication. I particularly like the illustrations, but the whole makeup is snappy, clean-cut, and dignified. The contents are intensely interesting. To me your 'digest' of recent patents is alone worth the price; I trust you will make it a permanent feature." So ordered, Mr. Davies, and many thanks. Any dissenters?

And while we're at it, Mr. Davies, let us present your thoughts and predictions also: "Plastic wares have been criticized as being stiff, hard, cold, precise and suitable only in the range of small articles,—'knick-knacks' merely. This may have been true at one time and such preciseness is extremely valuable at all times for certain goods—but as molding technique progresses we shall doubtless see such an improvement that all such objections will be overcome. As for the limits of size in plastic products, I predict that ultimately we will see furniture and building materials coming out of the country's molding plants in large volume, with such strength and inherent beauty combined as to surpass many natural products, and at lower cost. The automobile has credit for pulling us out of 1907's slump; the radio out-spoke that of 1921. Now in plastics it seems we have the basis for molding a new and great prosperity in the United States."

A story going the rounds at present concerns the man who paid for some merchandize with a cheque for $1.00. The recipient, in turn, paid a small bill with it, the third party did the same, and so on. The cheque finally reached the bank for collection bearing twenty endorsements. It was protested.

So they held a Creditor's Meeting, the original maker being on the outside, and rather than repay one another decided to sacrifice one-twentieth of their profit each and make good the loss. So-oo-oo, Graham, they each put up $.05 for the last man!

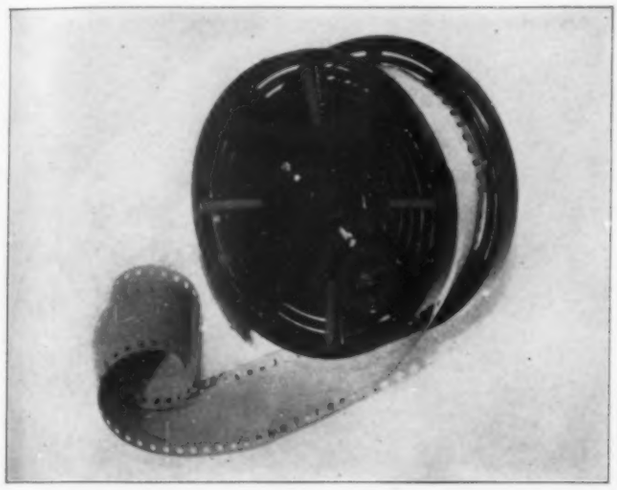
Note to the U. S. Postoffice:

Never mind correcting those letters we receive addressed to "Plastered Products." After December 6 we will be legal addressees!

There being no Holiday Code, we hope you have a good old fashioned Merry Christmas!

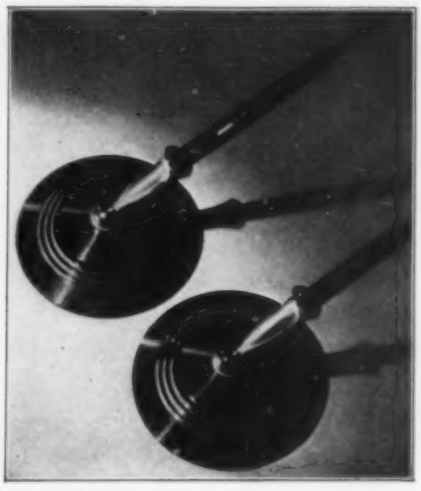
WHATEVER YOU NEED IN A MATERIAL *

★ PLASTICITY FOR INTRICATE SHAPES This movie film developer reel required a material that could be fashioned into delicate, intricate design, and could withstand the action of developing chemicals. Durez did it . . . economically. Notice the imbedded inserts, the minute accuracy which was required for the thread of the film through the reel.



★ CHEMICAL INERTNESS This Telephone Sanitator presented a material-selection problem. The tube contains chemicals which damaged most materials tried. But after months of constant contact they did not affect Durez at all. Large drug manufacturers specify Durez for closures because their own chemists' tests proved Durez to be most chemically inert.

★ STRUCTURAL STRENGTH This Bates Numbering Machine, molded of Durez, takes a terrific beating. But no matter how many thousands of times the knob is thumped . . . Durez won't show a sign of punishment.

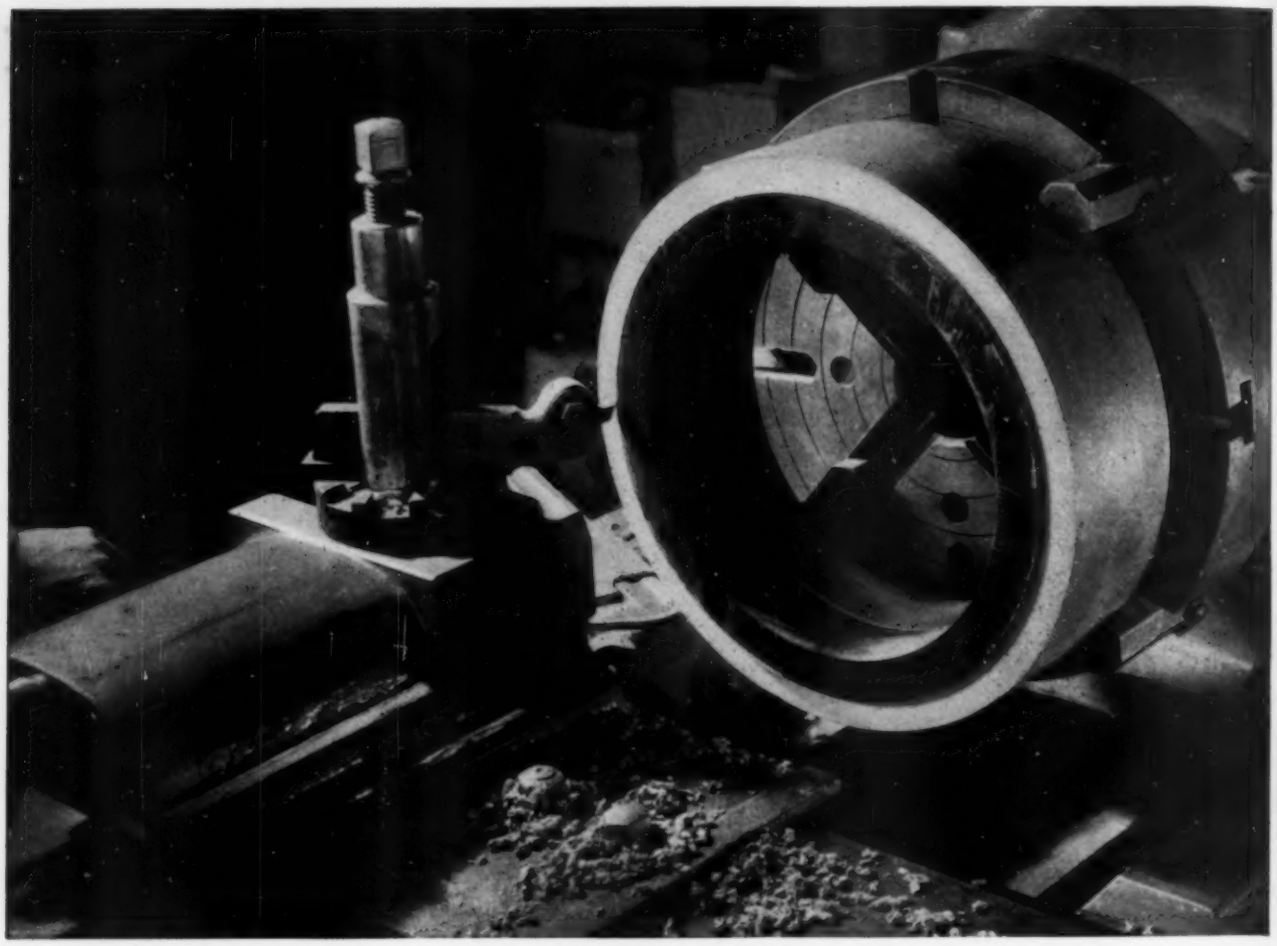


★ BEAUTY Durez' smooth, lustrous finish is obtained right in the molding process. Many surfaces . . . shiny, dull, burled . . . may be had. And Durez is available in a complete line of colors.

★ DIELECTRIC STRENGTH The use of Durez for case and arm mounting on this precision resistor saved assembly costs and made possible improved design. Because of Durez' high dielectric strength, it made other insulation unnecessary.

. . . YOU'LL FIND IT IN VERSATILE DUREZ!

We'll be glad to send you complete information on how Durez can help solve your own particular production problems. Write, General Plastics, Inc., 407 Walck Road, North Tonawanda, New York.



GOOD machining qualities, uniform physical and electrical properties are all combined in Synthane laminated bakelite. It is a valuable material for many mechanical and electrical applications. And it has in back of it Synthane service which assures co-operation in meeting requirements promptly and exactly. Samples for testing sent free on request.

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LIGHTNESS
STRENGTH
DURABILITY

HERE'S another case where one combination of Textolite's properties improved a product and gave it added sales appeal. In this miner's safety lamp—where the nature of service makes light weight, strength, and durability essential—the housing, bezel ring, switch knob, clamp support, and cord bushing are all made of Textolite.

Textolite is one of the lightest structural materials available; its weight is only half that of aluminum.

Textolite's unusual strength gives it a high ratio of strength to weight—nearly equal to that of soft steel.

Textolite's finish is permanent—it will not deteriorate or become affected by atmospheric conditions; its durability assures long life for the product.

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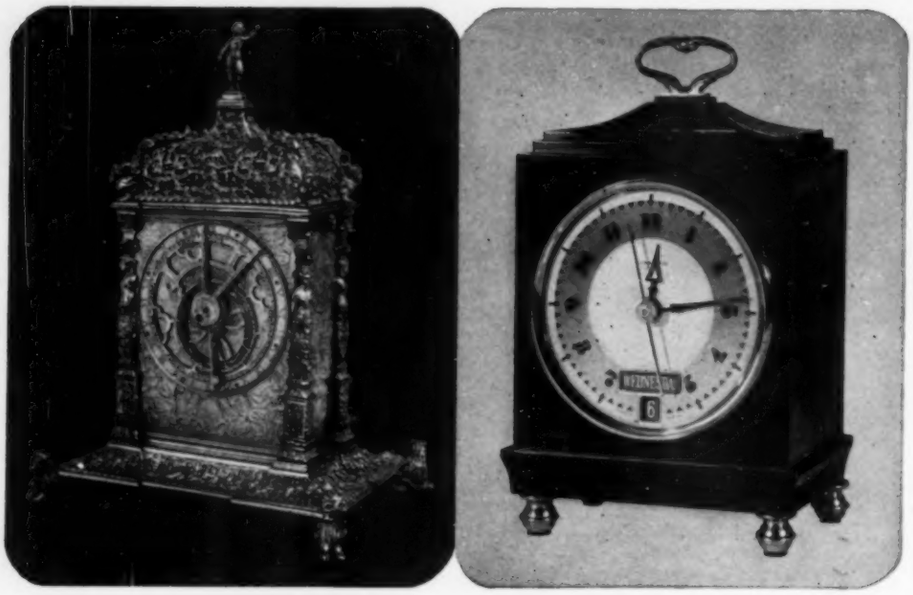
Calendar Clocks

FOR KINGS AND COMMONERS



A CENTURY or two ago the making of a movement of a calendar clock required many months of hand work by the most patient and skilful of craftsmen. They were so rare and costly that they were deemed worthy of elaborately ornamented cases wrought in bronze, silver or gold. Only Royalty could afford them.

In these modern days, calendar clocks may be owned by everyone. Instead of an intricate movement made by hand, there is a simple synchronous motor operated by an alternating electric current. Instead of a hand wrought case of precious metals, there is an attractive case of rich, lustrous Bakelite Molded. Instead of costing thousands of pounds, the modern calendar clock may be bought for a few dollars, and is far more accurate and dependable.

Bakelite Molded is made in a number of different types and in a variety of pleasing colors. There is a type of Bakelite Molded to meet almost any special need, whether it be resistance to acids, alkalis, moisture, heat, high tension current, or the need for exceptional strength or high lustre. This variety gives the custom molder an excellent opportunity to expand his business through proposing Bakelite Molded for parts now formed in other ways and of other materials.

Our new edition of booklet 22M, "Bakelite Molded" contains interesting illustrated descriptions of Bakelite Molding Materials and their uses, and may suggest ideas for you to pass on to your present and prospective customers. Your request will bring a copy by return mail.

★

Photographs show a German gilt bronze calendar clock of the 16th Century (Courtesy Metropolitan Museum of Art) and the modern Hammond Electric Calendar Clock of black Bakelite Molded designed by R. D. Budlong.

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